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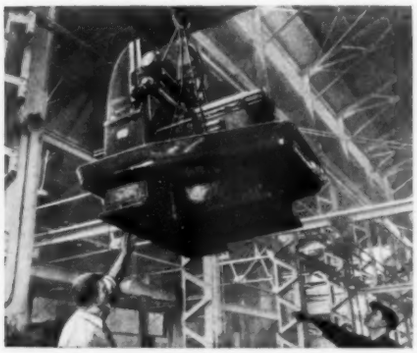

March of Machines—*Old machines make way for new as industry finds pressing need for replacement*

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VOLUME 84 NUMBER 11

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How to Use This Issue

★

These typical comments were received from readers after the 1935 Inventory of Metal-working Equipment; they are equally pertinent today.

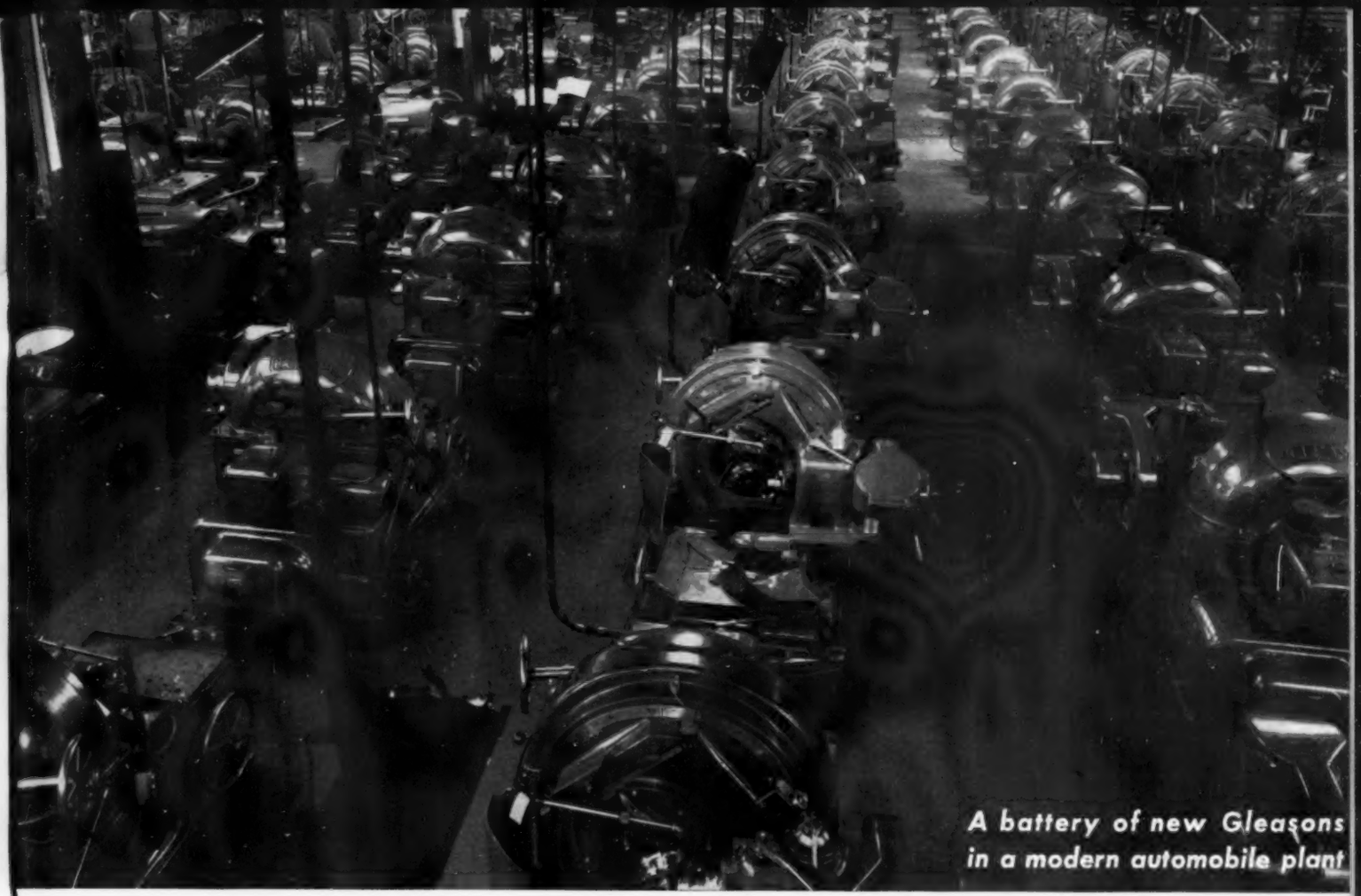
H. B. LOCKWOOD, *Equipment Manager*
Willard Storage Battery Co., Cleveland, Ohio

"I will refer your inventory, and the duplicate I have made for our own plant, to the Foremen of the departments concerned, giving them a chance to show me what savings are possible."

V. A. OLSEN, *Works Manager*
Cadillac Motor Car Co., Detroit, Mich.

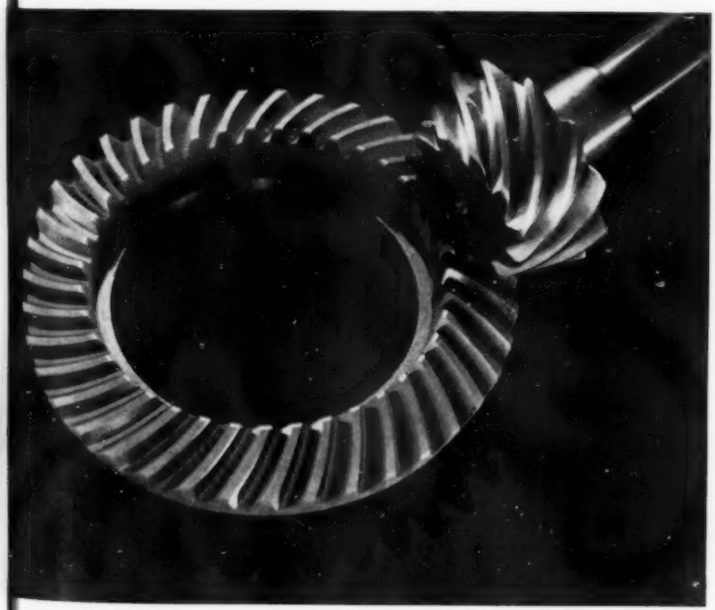
"I have found a lot to interest me in checking these statistics and am arranging to parallel them with a somewhat similar study of our entire Machine Tool Inventory. For a year or more we have been thinking along the lines of replacement of equipment which is either becoming obsolete from a modern design angle, or excessively costly from a maintenance angle."

For Profits—Modernize **NOW!**



A battery of new Gleasons in a modern automobile plant

DO YOUR PRODUCTION TIMES EQUAL THESE?



Automotive Hypoid Gear and Pinion
11/39 Teeth, 1½" Offset
Gear — 4½ D. P., 1¼" Face Width

Rough-cut gear teeth on No. 11 Gear Rougher
11½ gears per hour per machine

Finish-cut gear teeth on No. 11 Single-Cycle Finisher
11½ gears per hour per machine

Rough-cut pinion teeth on No. 15 Pinion Rougher
16 pinions per hour per machine

Finish-cut pinion teeth on No. 16 Hypoid Generator
9 pinions per hour per pair of machines

Note — pieces per hour based on hypoid pair at left and a quality better than ever before.

To cut your spiral bevel and hypoid gears faster, better and cheaper, modernize with new Gleasons. Send prints today for our production estimate on your job.

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

MODERNIZATION

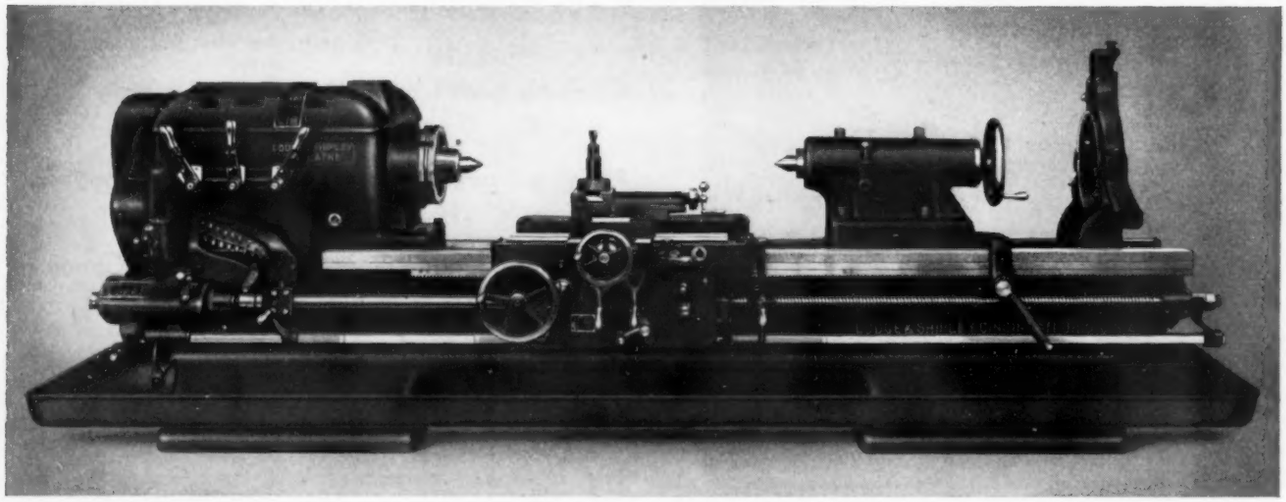
It can be said without fear of contradiction that a product can be no better than the machine tools used in its making.

That is why we have modernized the production equipment at Lodge & Shipley Machine Tool Company. Availing ourselves of the latest machine tools obtainable, we sincerely believe that our product—Lathes—reflect all the precision and accuracy of the modern machine tools of our production facilities.

Illustrated on these pages are various sizes and types of lathes, each designed to perform a separate and distinct class of work, yet all reflect in common the characteristics that have made Lodge & Shipley Lathes universally accepted, namely, advanced design, skilled craftsmanship, and choice materials.

Literature describing these modern Lodge & Shipley Lathes will be sent upon request.

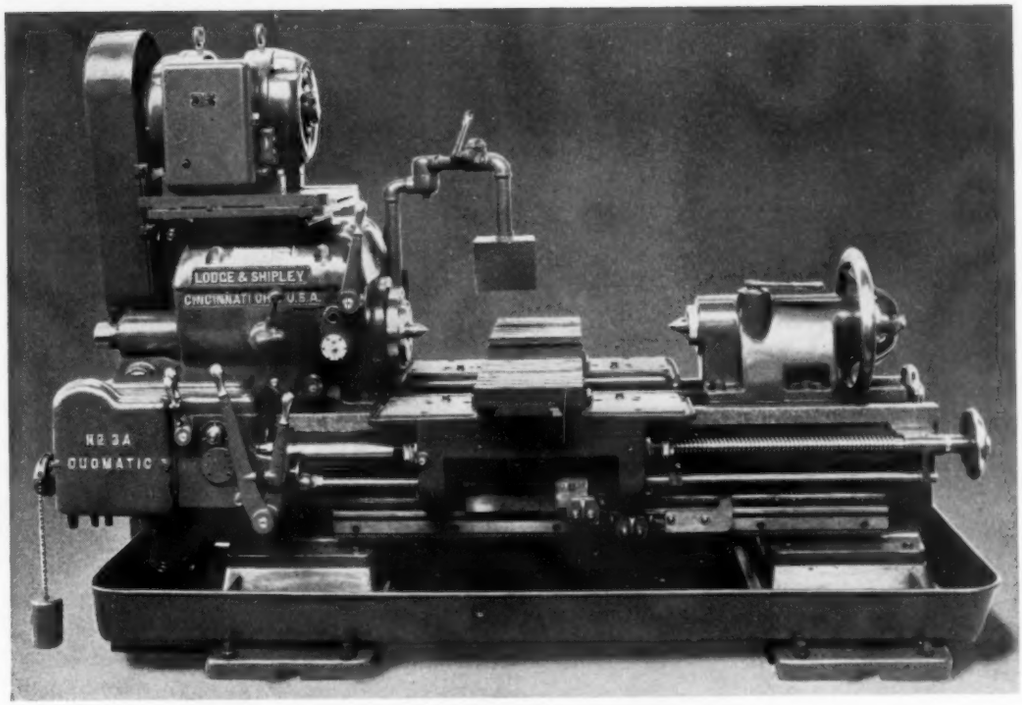
24" L. & S. Selective Head Lathe.



THE LODGE & SHIPLEY
CINCINNATI

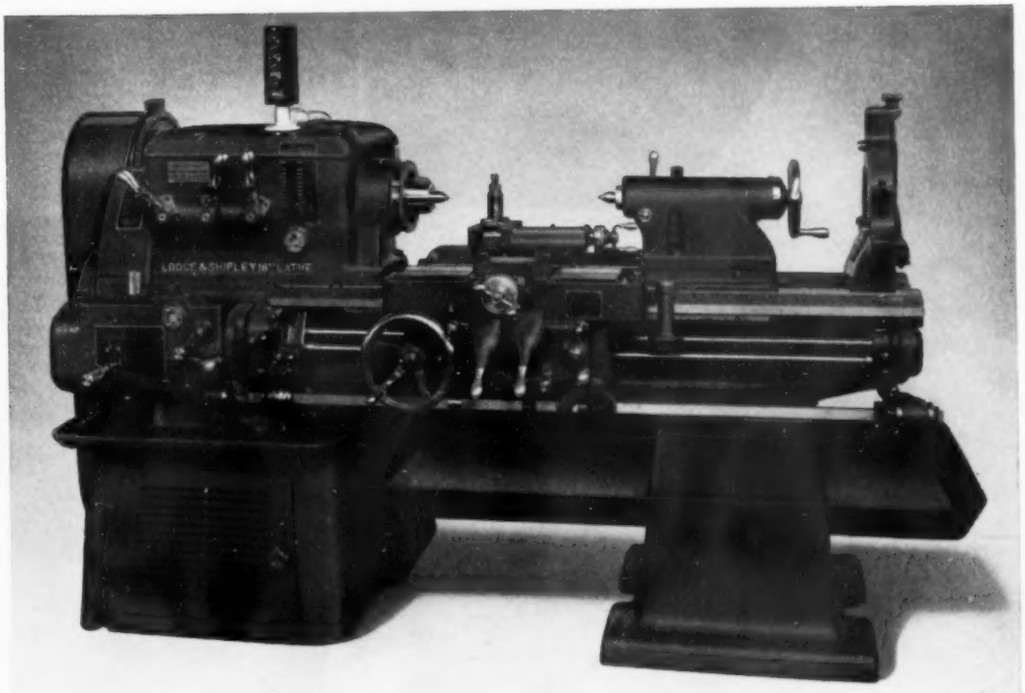
TECHNOLOGY DEPT

BEGINS AT HOME!



L. & S. No. 3A Duomatic Lathe.

16" L. & S. Selective Head Engine Lathe.



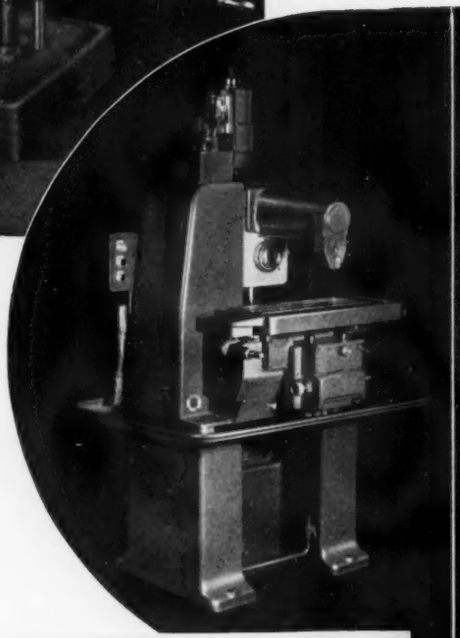
MACHINE TOOL CO.

OHIO, U.S.A.

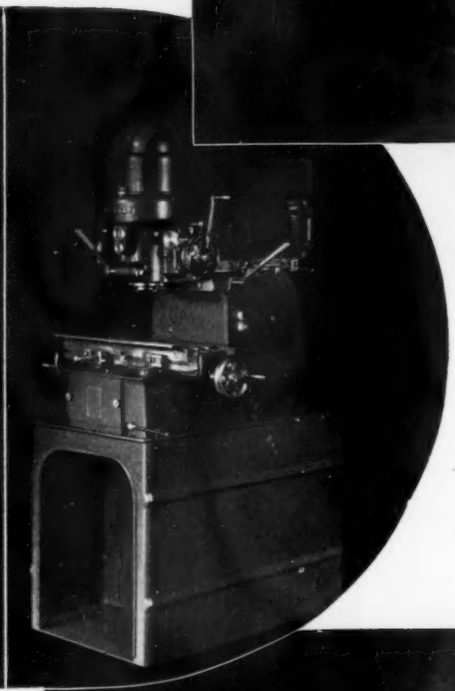
IT'S EASIER WITH THESE NEW

Above—New Dial Type Milling Machine. With these machines it's easier to maintain tool room standards for parts made in small or medium quantities. Plain machine illustrated. Also built in universal and vertical styles, Nos. 2, 3 and 4 size.

Above—No. 1-12 Plain Automatic Milling Machine. For shops where high production of small parts is an important factor. Also built in No. 1-18 size.

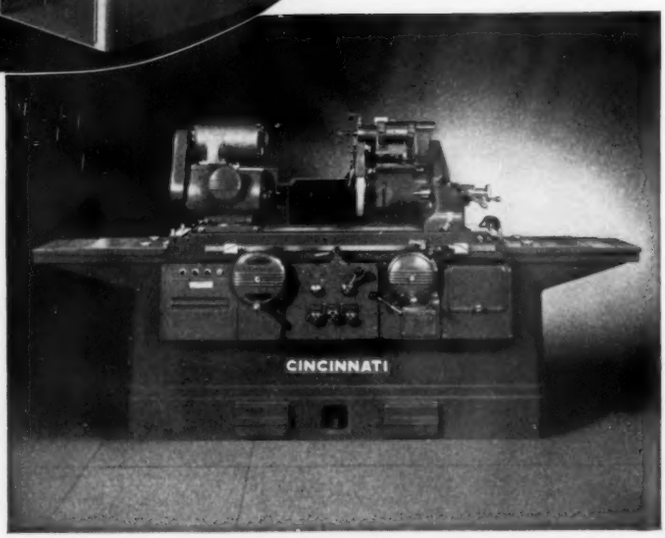


Right—New No. 0-8 Plain Automatic Milling Machine, equipped with rise and fall spindle carrier. A rapid producer for very small parts.



Left—New No. 0-8 Vertical Milling Machine. Important in the production of small parts when vertical milling is desirable.

New No. 2 Centerless Grinding Machine. Slashes grinding costs on a host of parts; steel, rubber, plastics, glass, etc. Economical for rather small lots, too.



New 12" Hydraulic Universal Grinding Machine. Raises tool room and job shop grinding to a new level of refinement. Made in 24", 36", 48" and 72" lengths.

THE CINCINNATI MILLING MACHINE COMPANY

CINCINNATI,

Tool Room and Manufacturing Milling Machines

Surface Broaching Machines

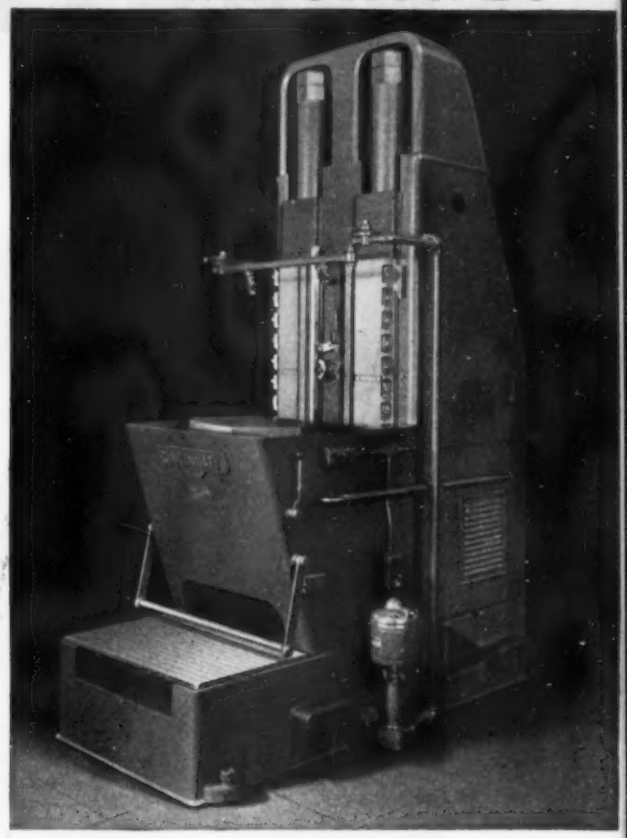
Cutter Sharpening Machines

AND IMPROVED CINCINNATI MACHINES

Increase Production ... Lower Costs ... ... Improve your Product

Increased industrial activity usually brings to light new problems in manufacturing, or magnifies the old ones. In some cases, higher production may be required to meet the demand. In others, it may be necessary to trim machining costs here and there. In still others, a new or improved product may be the answer. Whatever the problem confronting your shop, CINCINNATI Milling, Grinding, Broaching, Lapping, and Die-Sinking Machines will go a long way in helping you to find an economical solution. Literature on any of our products will be mailed on request.

See Pages 12 and 13 for Additional Cincinnati Milling, Grinding, Broaching and Die-Sinking Machines



No. 5-54 Duplex Hydro-Broach Machine. A continuous producer; broaches part in one station while other station is being loaded. Convenient for installation in production line. Made in several sizes.

PATENT NOTICE

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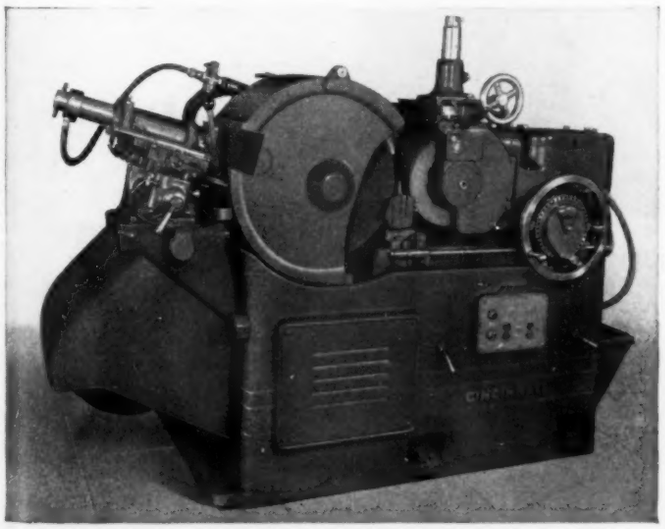


New No. 3 Centerless Grinding Machine. Takes larger work than the No. 2 size. Powered by 30 h.p. motor. Removes stock rapidly, and produces high quality work in the precision classification.

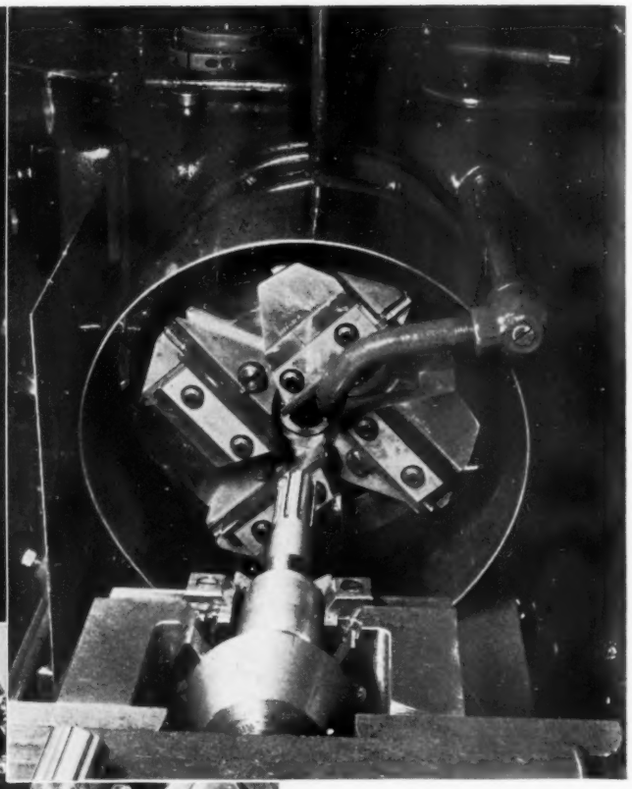
Plain Hydromatic Milling Machine. For conventional milling operation on the heavy jobs run in medium or large quantity production. May be equipped with hydraulic rise and fall spindle carriers. Eighteen sizes available.

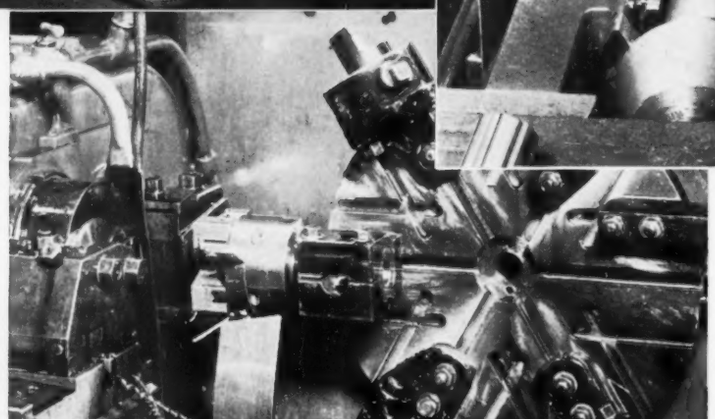
CINCINNATI GRINDERS INCORPORATED

OHIO, U. S. A.

Centertype Grinding Machines
Centerless Grinding Machines **Centerless Lapping Machines**

Performance is
of Mod





The **LANDIS** *Line*

STANDARD THREADING MACHINES
LANDMACO THREADING MACHINES
BOLT FACTORY THREADERS
AUTOMATIC FORMING AND THREADING MACHINES
SEMI-AUTOMATIC THREADING MACHINES
PIPE THREADING AND CUTTING MACHINES
PIPE AND NIPPLE THREADIG MACHINES
ROLLER PIPE CUTTERS
CHASER GRINDERS
ROTARY BOLT THREADING DIE HEADS
STATIONARY PIPE DIE HEADS
LANDMATIC HEADS FOR TURRET LATHES
LANDEX HEADS FOR AUTOMATIC SCREW MACHINES
LANCO HEADS FOR HAND-OPERATED THREADING MACHINES
LANDIS COLLAPSIBLE AND ADJUSTABLE TAPS
LANHYDRO (Hydraulically Controlled) THREADING MACHINES

LANDIS MACHINE C
WAYNESBORO,

s the Proof
odernization

The machine tools of 12 or 15 years ago were not designed and are not capable of producing the fine accuracy, at the high production, of present day requirements.

While LANDIS Die Heads and Threading Machines have long been recognized for their ability to produce threads of fine accuracy—the complete modernization of the entire LANDIS LINE now makes available for Industry—Die Heads and Threading Machines which lead the way to new performance standards.

For Complete Modernization in Threading

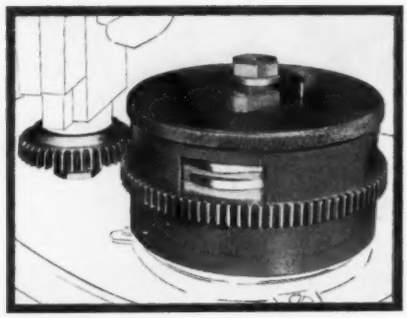
LANDISIZE

LANDISIZE—for Unexcelled Thread Accuracy—
for Greater Production—for Lower Threading Cost

LANDIS Die Heads and Threading Machines are employed extensively in almost every kind of Industry. Investigate the advantages of using this modern Thread Cutting Equipment for your thread cutting operations.

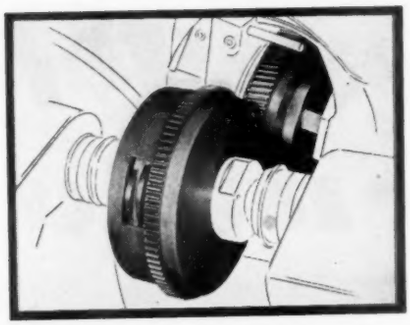
Submit your threading problems to our Engineers today

COMPANY, Incorporated
PENNA., U. S. A.



GEAR CUTTING

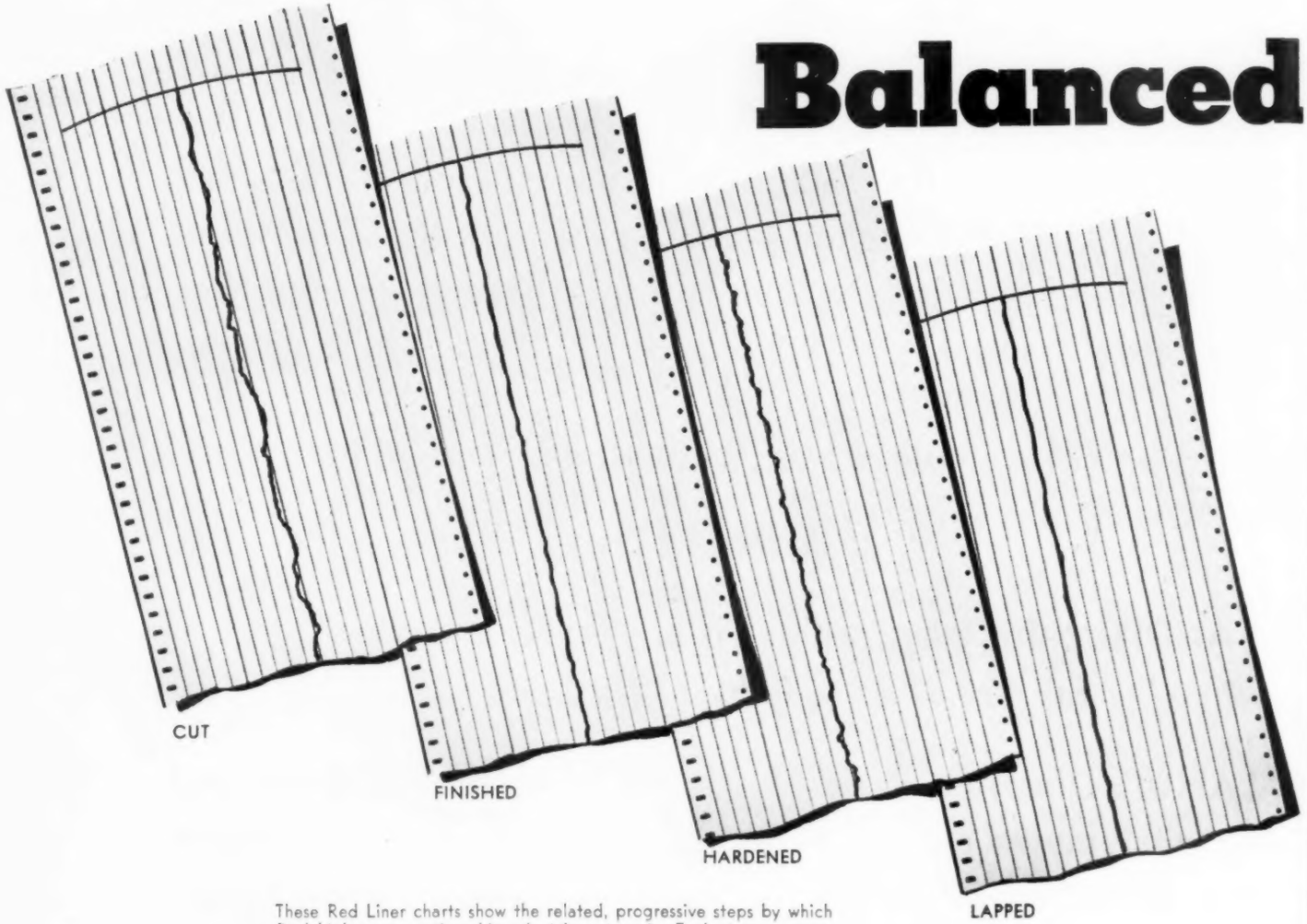
on Fellows Gear Shapers with Original Fellows Gear Shaper Cutters.



GEAR FINISHING

on Fellows Gear Finishing Machines for accuracy beyond precedent.

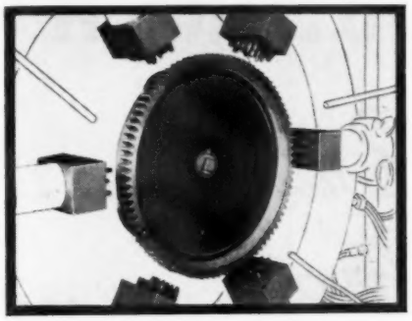
Balanced



These Red Liner charts show the related, progressive steps by which final high accuracy is achieved at lowest cost. Each step prepares for that which follows, and permits each to function at its peak of efficiency.

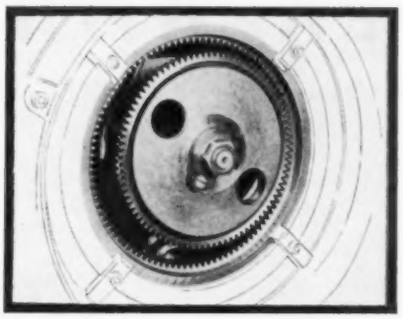
THE FELLOWS GEAR

BRANCH OFFICES:—



GEAR HARDENING

on Fellows Flame Hardening Machine for hardening with minimum distortion.



GEAR LAPPING

on Fellows Lapping Machines for final accuracy on high production basis.

Performance . . .

● **Gear production operations which comprise THE FELLOWS METHOD are cutting, finishing, hardening, lapping and testing.**

Each operation is related in precision to that which follows. Each is designed to perform its function satisfactorily so that the succeeding operation proceeds with maximum efficiency — as to production time and unit cost. That is where the adoption of The Fellows Method is of positive advantage over a combination of nonintegrated methods. This unified, balanced performance assures lower overall costs . . . Our sales engineers will welcome the opportunity to counsel with you on your gear production routine—as a whole, or in part. For your consideration we should like to send you our recent 64-page book "The Fellows Method", if you will write us on your business letterhead. Write: The Fellows Gear Shaper Company, Springfield, Vermont.

FELLOWS
Complete Line for Precision Gear Manufacturing

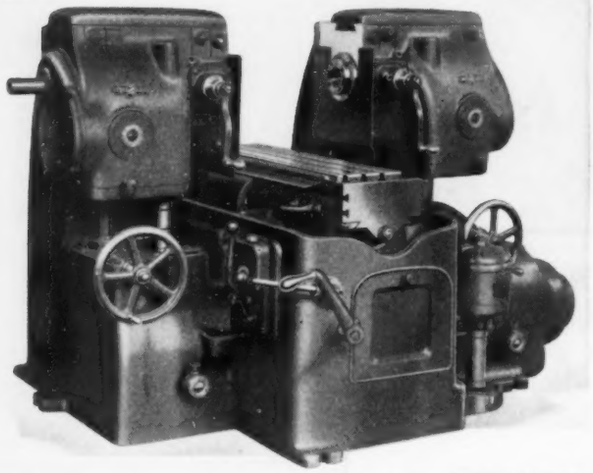
GEAR SHAPERS
RACK SHAPERS
COMPLETE LINE OF CUTTERS
THREAD GENERATORS
MASTER GEARS
LAPPING MACHINES AND LAPS
HELICAL CUTTER SHARPENERS
BURNISHING MACHINES
TESTING EQUIPMENT

S H A P E R C O M P A N Y

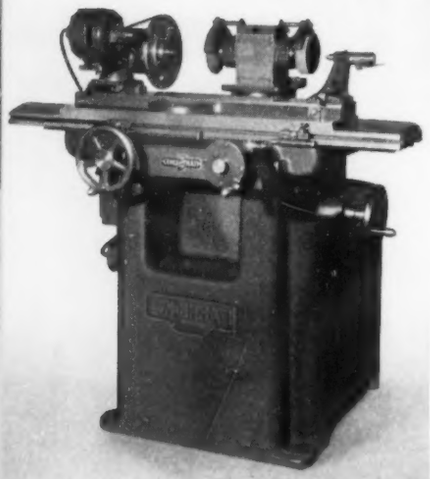
78 River Street, Springfield, Vermont

318 FISHER BUILDING, DETROIT, MICHIGAN—640 WEST TOWN OFFICE BLDG., CHICAGO, ILLINOIS

IT'S EASIER WITH THESE NEW



Above — Duplex Hydromatic Milling Machine, Two spindles available for milling two sides of the work simultaneously. May be equipped with hydraulic rise and fall spindle carriers. Built in eighteen sizes.



Left—No. 2 Cutter and Tool Grinding Machine. Quickly and accurately sharpens majority of cutters used in metal working shops.

Increase Production ... Lower Costs ..... Improve your Product

You may be confronted with the necessity of increasing the output of your shop to meet a larger demand . . . excessive machining costs may need trimming here and there . . . or perhaps a new product is taking shape in your drafting department. Whatever the problem, the new and improved CINCINNATI machines shown on these pages offer attractive possibilities for more profitable machining operations in the fields of milling, precision grinding, broaching, and die sinking. Literature for any of the machines illustrated, or any other machines included in our standard line, will be mailed on request.

See Pages 6 and 7 for Additional Cincinnati Milling, Grinding, and Broaching Machines.

PATENT NOTICE

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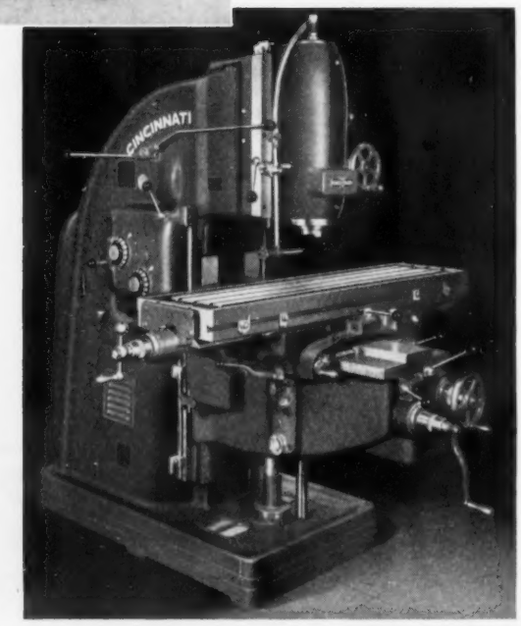
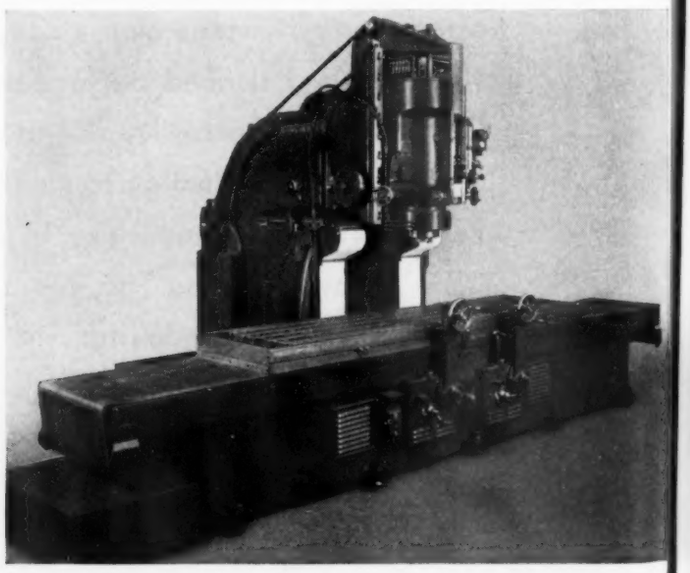


New Vertical Dial Type Milling Machine. Also built in plain and universal styles, Nos. 2, 3 and 4 sizes.

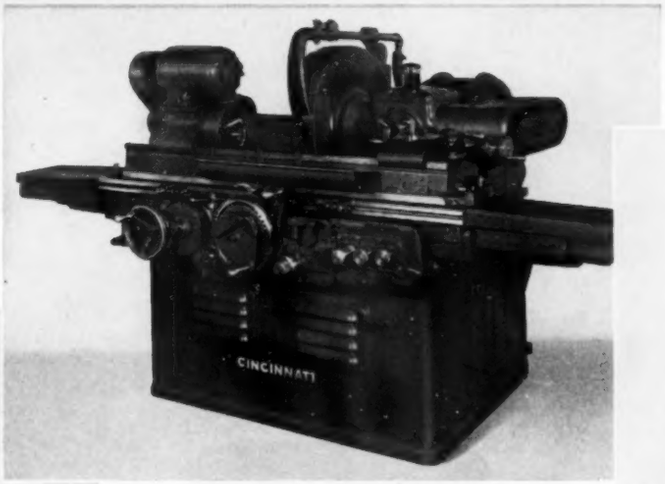


Vertical Hydro-Tel Milling Machines. For heavy milling or fine die sinking. Tops in rapid metal removal. Finger-tip controls move heavy slides with almost no effort. Seven sizes available.

THE CINCINNATI MILLING MACHINE COMPANY
CINCINNATI,

Tool Room and Manufacturing Milling Machines
Surface Broaching Machines Cutter Sharpening Machines

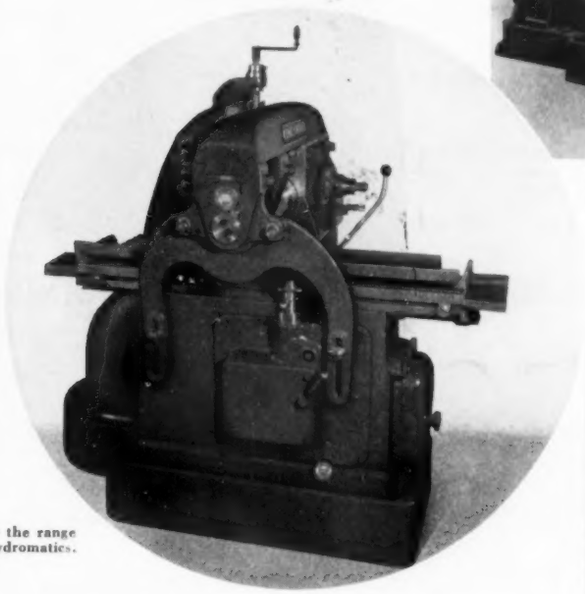
AND IMPROVED CINCINNATI MACHINES



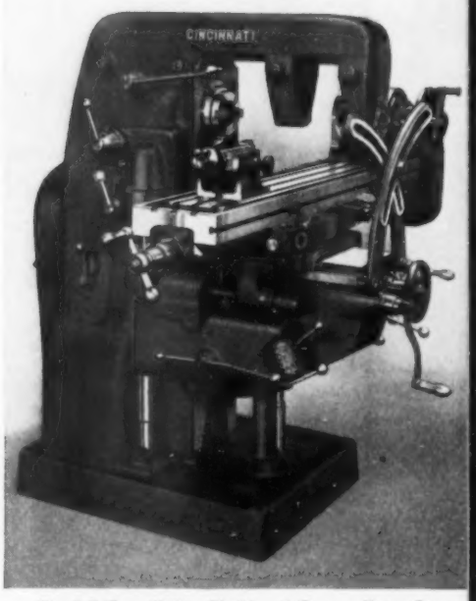
Plain Hydraulic (Saddle Type) Grinding Machine. For relatively small and short work run in any quantity. Sizes available: 6"x18", 6"x30", 10"x18", 10"x36".

Single Ram Vertical Hydro-Broach Machine. Very narrow width; can be installed close to other machines. Several sizes available.

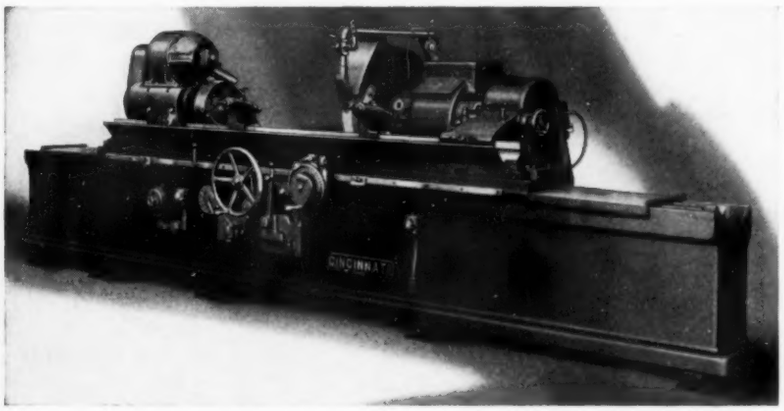
High Power Milling Machine. For the heavy jobs that take a lot of power. Sizes available: No. 4; plain, universal, and vertical. No. 5; plain and universal.



Right—No. 2-18 Milling Machine. For the range of work between the 1-12 and Hydromatics. Made in 18" and 24" table travels.



No. 2 L-Type Milling Machine. L-Type spells profits for small miscellaneous milling jobs. Also a good machine for instruction purposes in vocational schools. Two styles: plain and universal.

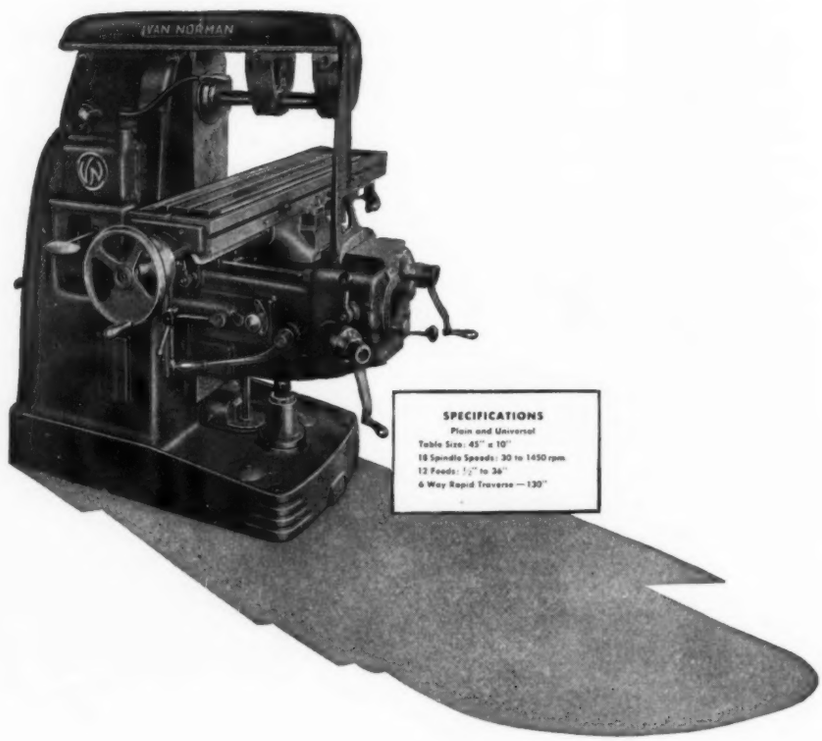


Plain Self-Contained Grinding Machine. Widely used for grinding fussy jobs such as spindles. Removes metal rapidly to high quality finish and accuracy. Made in 14" and 16" sizes, seven between-center lengths from 36" to 168".

CINCINNATI GRINDERS INCORPORATED

OHIO, U. S. A.

Centertype Grinding Machines
Centerless Grinding Machines Centerless Lapping Machines


VAN NORMAN
SPECIFICATIONS
Plain and Universal
Table Size: 45" x 10"
18 Spindle Speeds: 30 to 1450 rpm
12 Feeds: ½" to 36"
6 Way Rapid Traverse — 130"

VAN NORMAN MI

Unusual compactness, with exceptional rigidity and dependability. Strength with sensitivity. Extreme accuracy with ease of operation and control. Wide range of feeds and speeds, controlled by a single lever selector. Directional rear controls as well as front controls for all power feeds. Power rapid traverse in all directions. All these features combine to increase output and profits for you. There, in the fewest words, is the complete picture of the new Van Norman No. 2-L Horizontal Milling Machine in plain and universal models. If you would like us to fill in the details, simply write for new illustrated bulletin to:

VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASS.

LLING MACHINES··

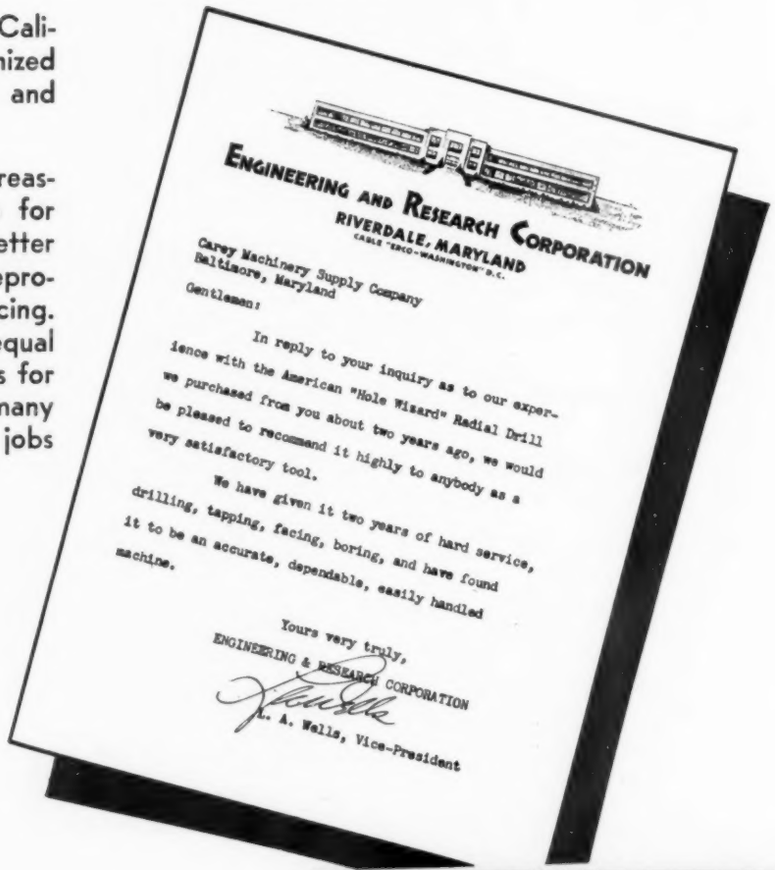
THE "AMERICAN" HOLE WIZARD

KNOWN FROM THE ATLANTIC TO THE PACIFIC

for versatility, power and accuracy...

From Farmingdale, Long Island to Alhambra, California, the "AMERICAN" Hole Wizard is recognized as a radial drill of exceptionally wide range and adaptability.

This "newest of new radials" is finding ever-increasing acceptance not only for drilling, but also for tapping, facing, boring (as evidenced by the letter from the Engineering and Research Corp. reproduced here) as well as counterboring and spot facing. Ability to handle all these operations with equal facility on the Hole-Wizard is one of the reasons for the almost constant use of this machine in the many shops where it is used. Time savings on these jobs add up so high that first cost is quickly repaid.



ENGINEERING AND RESEARCH CORPORATION
RIVERDALE, MARYLAND
CABLE "ERCO-WASHINGTON" D.C.

Carey Machinery Supply Company
Baltimore, Maryland

Gentlemen:

In reply to your inquiry as to our experience with the American "Hole Wizard" Radial Drill we purchased from you about two years ago, we would be pleased to recommend it highly to anybody as a very satisfactory tool.

We have given it two years of hard service, drilling, tapping, facing, boring, and have found it to be an accurate, dependable, easily handled machine.

Yours very truly,
ENGINEERING & RESEARCH CORPORATION
L. A. Wells, Vice-President

EAST COAST: Boring with an "American" Hole Wizard at Seversky Aircraft Corporation at Farmingdale, Long Island, New York.

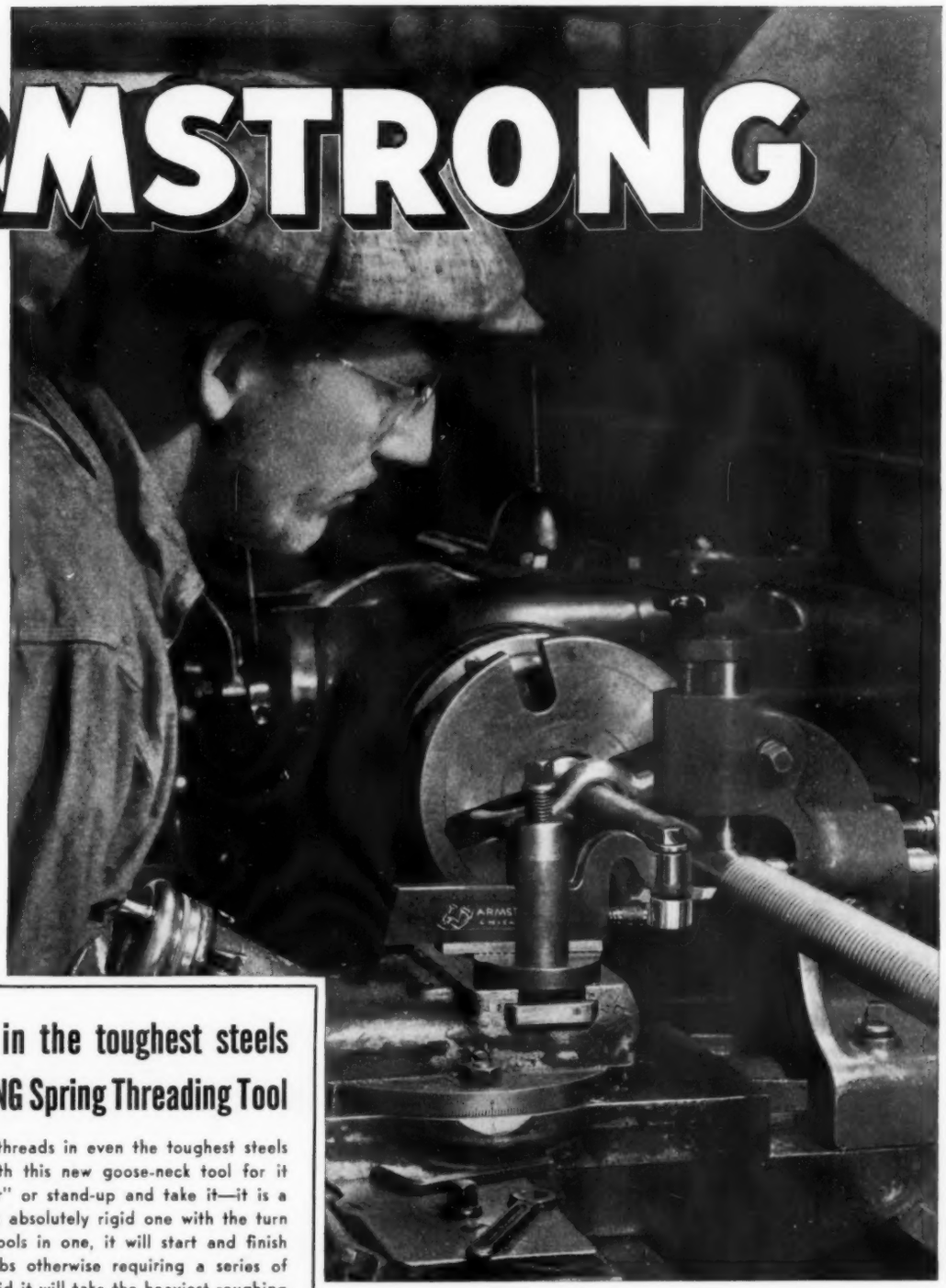
Get all the facts concerning the dividend-earning possibilities offered you in the "AMERICAN" Hole Wizard.

WEST COAST: Drilling operation on "American" Hole Wizard at Reliance Regulator Manufacturing Co. at Alhambra, California.

The AMERICAN TOOL WORKS CO.

CINCINNATI, OHIO, U. S. A.

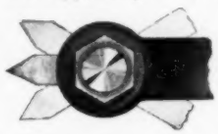
ARMSTRONG



Smooth threads in the toughest steels with an ARMSTRONG Spring Threading Tool

It is easy to cut smooth threads in even the toughest steels and gummiest brasses with this new goose-neck tool for it can "duck-out from under" or stand-up and take it—it is a resilient spring tool, or an absolutely rigid one with the turn of a thumbscrew. Two tools in one, it will start and finish threading and turning jobs otherwise requiring a series of tools. With cutter held rigid it will take the heaviest roughing cut. It will carry on where a solid tool would dig-in and tear or cause work to climb up on the tool and with the turn of a thumbscrew can be made rigid for an accurate finishing cut.

ARMSTRONG Spring Threading Tools take cutter bits quickly ground from standard square high speed steel shapes. Hold cutters in any of 3 positions to give the most convenient tool approach, come with one V-thread cutter and Drop Forged Wrench. Write for Catalog C-39 showing ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers.

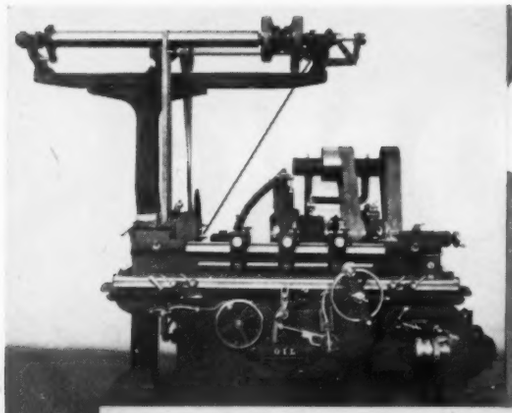


ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. FRANCISCO AVE. CHICAGO, U. S. A.

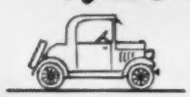
Eastern Warehouse and Sales:
199 Lafayette St., New York

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

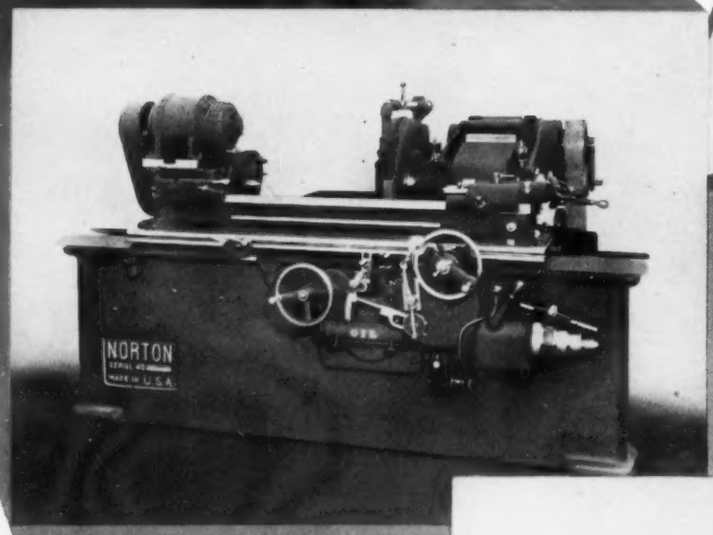


1925

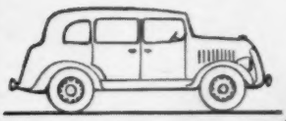


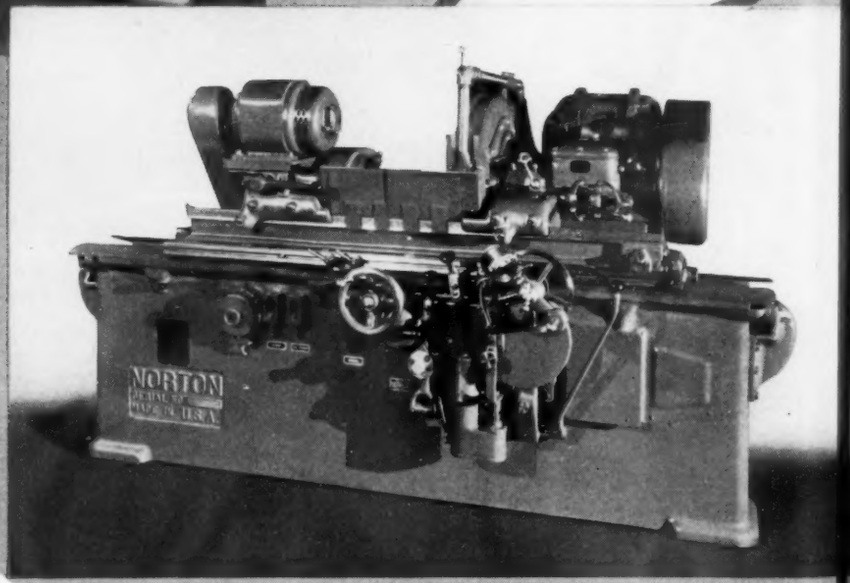
IN WHICH

1930



1935





Complete information on request about Norton Grinding, Lapping and Superfinishing Machines for cylindrical parts and flat surfaces.

NORTON MACHINES

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Cleveland Hartford

PERIOD ARE YOU GRINDING?

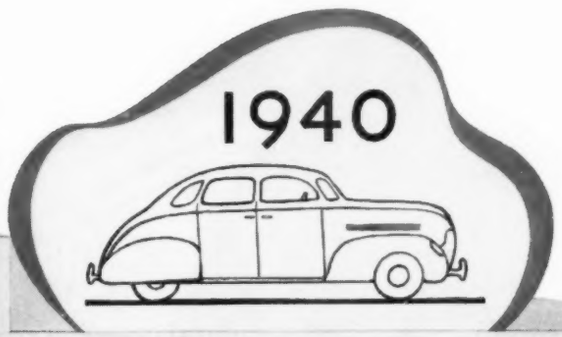
GRINDING machines like motor cars have been improved greatly in quality, technique and appearance during the past 15 years. The modern car still uses a crankshaft, pistons, transmission and differential but the quality built into these components is far superior to what was acceptable 15 years ago.

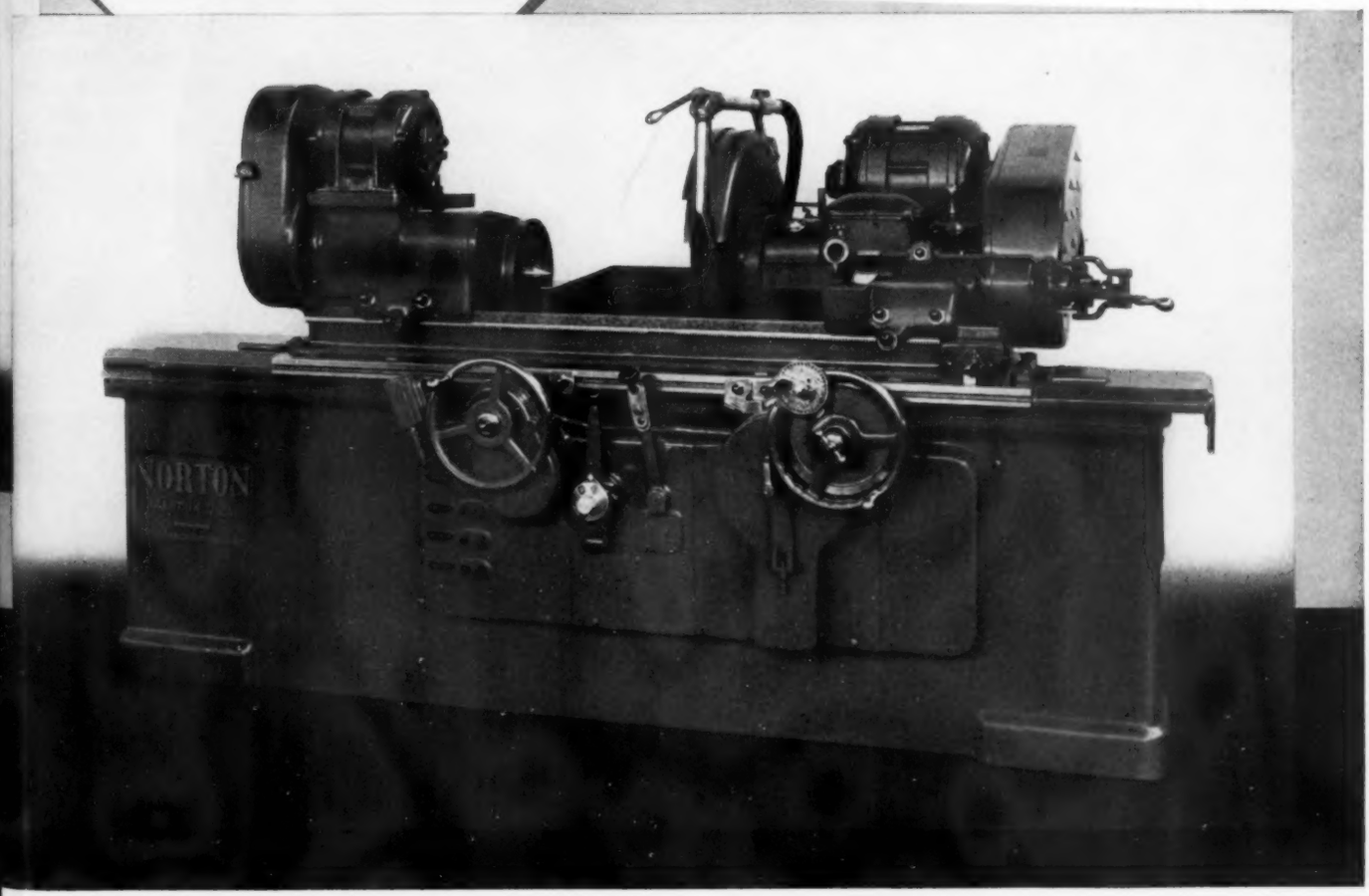
So it is with the Norton cylindrical grinder. Today's machine weighs 40% more than the 1925 model of the same capacity. Individual motor drives have supplanted belt driven models. Larger and better grinding wheels are used, spindle bearings are flood lubricated with kerosene and constructed so that bearing clearances are smaller and finer finishes are produced.

The 1940 grinder is different in appearance, yes—but great advances have been made in the so-called intangibles—the materials employed, the finishes, fits and proportions of various elements.

You can drive from coast to coast probably in a 1925 car but you can do it safer, more comfortably and with greater pleasure in a modern type. Likewise, 1925 grinders do a fair job but it is the modern machine that produces according to 1940 standards.

M-419



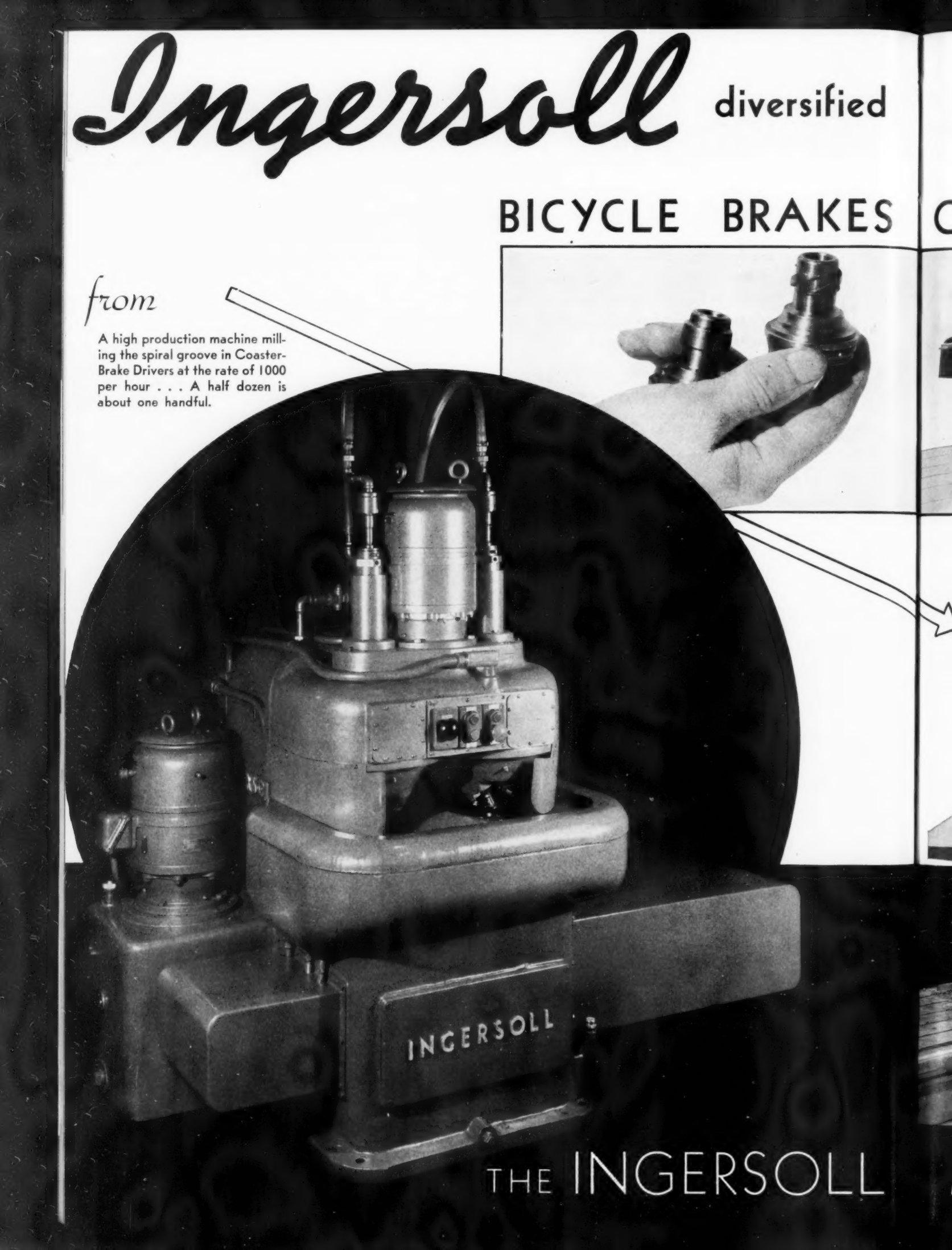


Ingersoll diversified

BICYCLE BRAKES

from

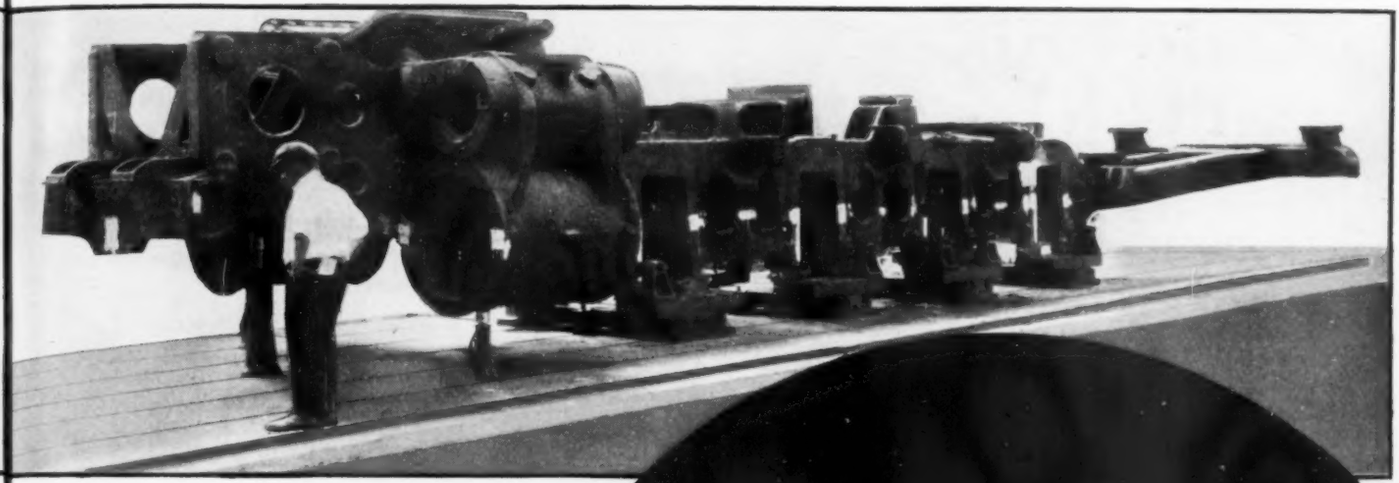
A high production machine milling the spiral groove in Coaster-Brake Drivers at the rate of 1000 per hour . . . A half dozen is about one handful.



THE INGERSOLL

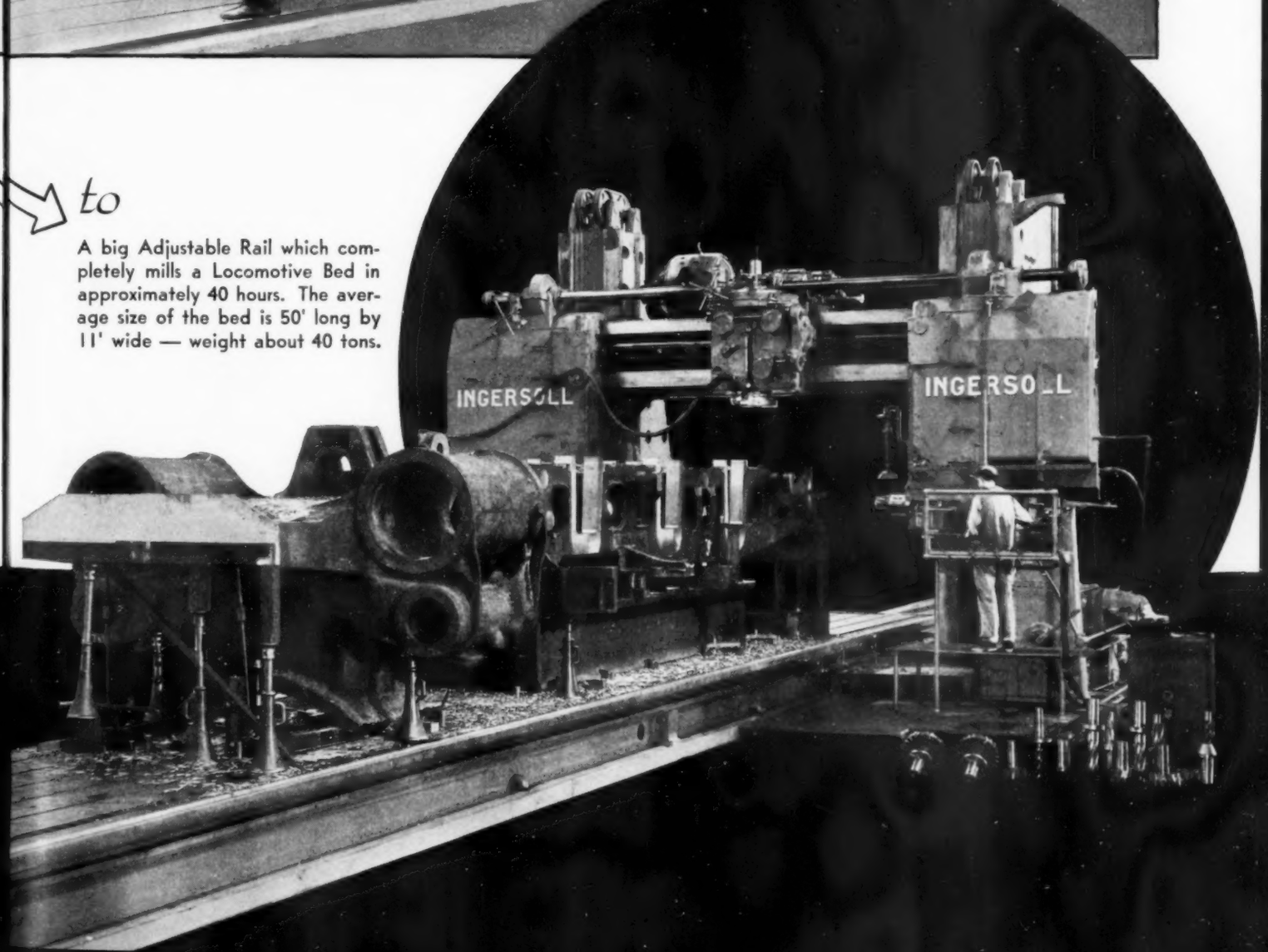
Engineering

OR LOCOMOTIVE FRAMES



to

A big Adjustable Rail which completely mills a Locomotive Bed in approximately 40 hours. The average size of the bed is 50' long by 11' wide — weight about 40 tons.



MILLING MACHINE CO. ROCKFORD ILLINOIS.

HOW BIG IS *1 Sq. Ft.* IN YOUR PLANT ?

(IN TERMS OF PRODUCTION AND PROFIT)

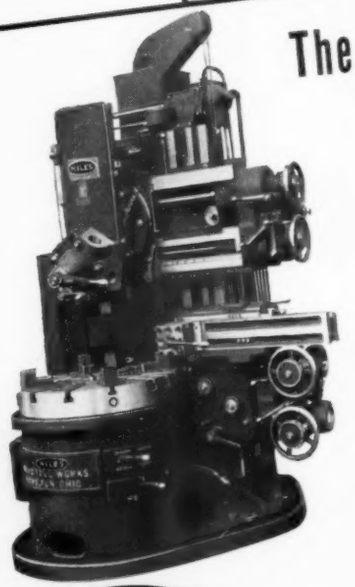
NILES

WILL PUT SPACE YOU

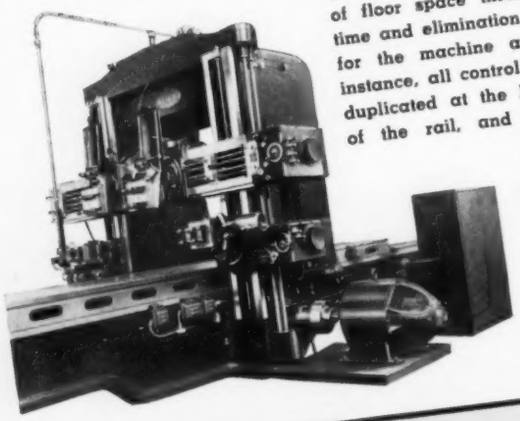
The NILES 90" Driving-Wheel Lathe

Typical of Niles Railroad Tools is this 90" Heavy Driving-Wheel Lathe designed for the heaviest tire-turning duty with modern tool steel. It is of exceptionally massive weight, liberally proportioned, to assure rigidity and smooth operation under the heaviest duty. Like all Niles machines, this lathe is equipped with all the latest improved time- and labor-saving devices. It not only will increase the speed of your production, but improve the quality of it as well. Standard patterns available in 69", 79" and 90" sizes.

The



NILES "Time-Saver" Planers



Here indeed is a tool that is certain to give you more production per square foot of floor space through reduction of idle time and elimination of waste motion both for the machine and its operator. For instance, all control levers for the rail are duplicated at the back or left hand end of the rail, and each head carries a similar control for controlling the feed and rapid power traverse. Quadruplex rail head control saves many moments of valuable time — But get the whole story—Send for our Folder 325-1.

THE NILES LINE

LATHES
OPENSIDE PLANERS
DOUBLE HOUSING PLANERS
BORING MILLS

•

ROTARY MILLERS
DRUM MILLERS

•

RAILROAD TOOLS
ARSENAL EQUIPMENT
PLATE PLANERS

•

PRODUCTION IMPROVING TOOLS

MORE PROFIT "INCHES" INTO THE DEVOTE TO CUTTING OPERATIONS!

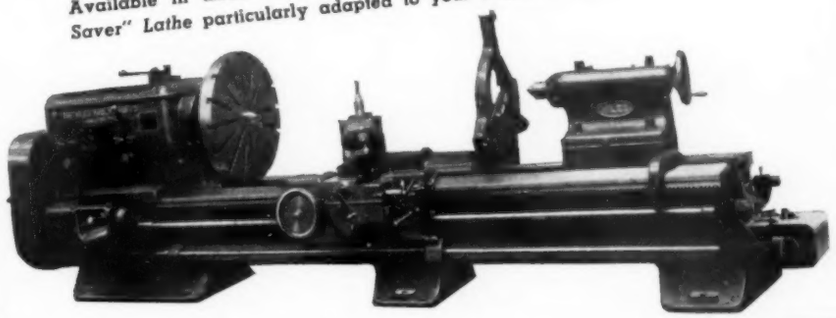
● In terms of *profit*, a square foot of floor space is only as big as the production it accounts for . . . and making your present floor space increasingly productive is about the quickest, surest way of solving the delivery problem created by today's pressing demands and assuring wider profit margins on the greater volume you can handle. The *Niles Line* of time-saving higher capacity machines offers you a proven means of adding many *profit* "inches" to every square foot devoted to various cutting operations. Shown opposite are four such tools, ready to demonstrate their profit-promoting qualities where it counts *most* . . . in *your* shop. Why not let us send you full details on one or all of them, depending upon your requirements?

NILES Side Head Boring Mill

Space and time conservation was a primary consideration in designing this popular machine . . . one which is equally suited for turning out a few pieces or quantity production. The simplicity of its manipulation, due to a more convenient grouping of controls made possible by its vertical design; the rapidity with which work can be set up; the greater ease by which heavy or irregular shaped work can be secured to its horizontal table where gravity is an assisting factor . . . these, and many other features assure more profitable production with the *Niles Side Head Boring Mill.*

NILES "Time-Saver" Lathes

We call this a "Time-Saver", first, because it has the driving power, strength, and rigidity to reduce actual turning time to a minimum by taking the heaviest cuts possible with high speed steels. In addition, its unusual conveniences of control and operation speed up the operator's work in every move and also, by lightening the work, maintain his efficiency over longer periods of continuous operation. Available in three sizes, 27", 30" and 36", there's a *Niles "Time-Saver" Lathe* particularly adapted to your requirements.

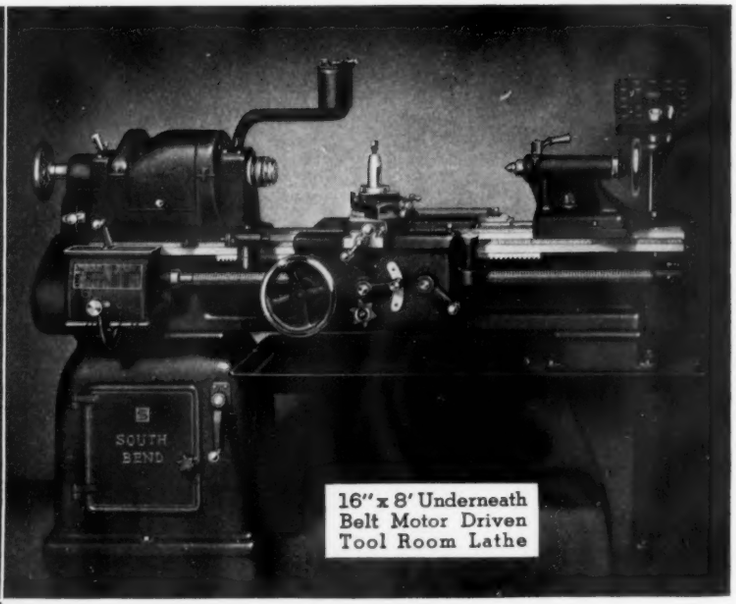


GENERAL MACHINERY CORPORATION

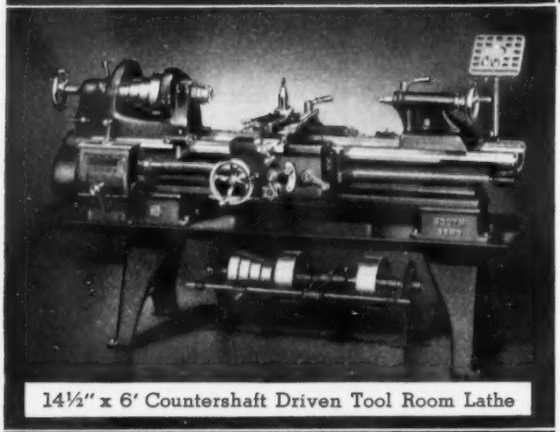
NILES TOOL WORKS DIVISION

HAMILTON, OHIO

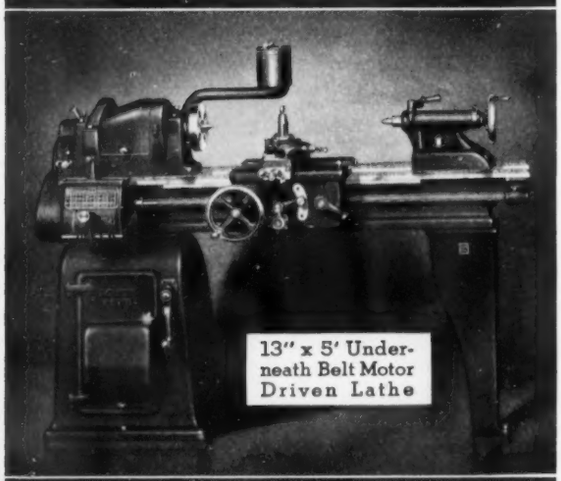
1" Collet, 10" Swing Precision Lathe



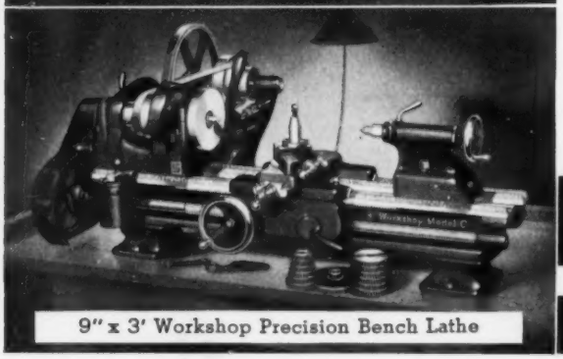
16" x 8' Underneath Belt Motor Driven Tool Room Lathe



14½" x 6' Countershaft Driven Tool Room Lathe



13" x 5' Underneath Belt Motor Driven Lathe



9" x 3' Workshop Precision Bench Lathe

SOUTH BEND LATHES

The practical design and fine workmanship of South Bend Lathes has made them the popular choice of men, throughout the world, who know machinery. Their versatility is established by the fact that they are used for Production Manufacturing, Precision Tool Room Work, General Machine Work and maintenance in all metal working industries.

Manufactured in 9", 10", 11", 13", 14½" and 16" swing, in 3' to 12' bed lengths, in Motor Drive and Countershaft Drive, all in Quick Change Gear or Standard Change Gear Types. Prices range from $79.50 to $1800.

New South Bend Lathe Catalog

Write today for a copy of our new 112-page catalog describing all sizes and types of South Bend Lathes.

ON DISPLAY IN ALL PRINCIPAL CITIES

Popular sizes of South Bend Lathes are carried in stock for prompt delivery and demonstration by machinery dealers in 477 of the principal cities of the world. A few prominent distributors displaying South Bend Lathes are listed below. Write for name of dealer nearest you.

Boston, Mass. — MacKenzie Mach. Co.
Bridgeport, Conn. — A. C. Bisgood
Baltimore, Md.—Carey Machine Co.
Cleveland, Ohio — Reynolds Mach. Co.
Dayton, Ohio — C. H. Gosiger Mach. Co.
Detroit, Mich.—Lee Machinery Company
Houston, Tex.—Wessendorff, Nelms & Co.
Los Angeles, Cal.—Eccles & Davies
Milwaukee, Wis.—W. A. Voell Mach. Co.
Newark, N. J. — J. R. Edwards Mach. Co.
New York, N. Y.—A. C. Colby Mach. Co.
Philadelphia, Pa. — W. B. Rapp, Mach.
Pittsburgh, Pa.—Tranter Mfg. Company
Portland, Ore.—Portland Machinery Co.
Providence, R. I.—Geo. T. Reynolds & Son
Rochester, N. Y.—Ogden R. Adams
San Francisco, Cal. — Moore Mach. Co.
York, Pa.—York Machinery & Supply Co.

South Bend Lathe Works

225 E. Madison St., South Bend, Ind., U. S. A.

Lathe Builders Since 1906

TRADE MARK SOUTH BEND TWINS ENGINE LATHES

NO OBSOLESCENCE TOLERATED HERE

THE MONARCH MACHINE TOOL COMPANY — SIDNEY, OHIO

Look to CONSOLIDATED

EXPERIENCE *for your Modernization needs*

During the past five years we have successfully built among others the following listed types of Machine Tools. Many of these machines were designed and built from the ground up, and many of them are of extremely large size.

Colburn and Betts Heavy Duty Boring Mills with (patented) Timken Table Mounting.
Colburn Precision Boring Machines.
Newton Rotary Continuous Milling Machines (single and multiple spindle).
Newton Hydraulic Feed Cold Saws.
Newton Keyway Milling Machines.
Newton MILL-N-SHAVERS (Patented).
Newton Openside Milling Machines.
Newton Unit Head Milling Machines.
Newton Profile Milling Machines.
Newton Drum Type Milling Machines.
Newton Screw Driven Portable Slotters.
Newton Rise & Fall Milling Machines.
Newton Sliding Head & Planetary Millers.
Newton Rail Drilling Machines.
Betts Hydraulic Feed Car Wheel Borers.
Betts-Bridgeford Heavy Duty Engine Lathes from 26" up to 128" swing.
Betts-Bridgeford Axle Lathes.
Betts Double Housing Planers.
Betts Slotting Machines.
Betts Heavy Duty Tire Mills.
Hilles & Jones Plate Bending Rolls.
Hilles & Jones Plate Jogglers and Plate Scarfing Machines
Hilles & Jones Plate Edge Planers.
Hilles & Jones Multiple Punches & Guillotine Plate Shears & Bar Shears.

In building these machines we have used the latest available materials and have taken full advantage of all tried and proven improvements such as:

PRECISION ANTI-FRICTION BEARINGS—HARDENED AND GROUND STEEL WAYS—AUTOMATIC LUBRICATION—LATEST ALLOY STEELS—FLAME HARDENING—MULTIPLE SPLINED SHAFTS—ACCURACY TO EXTREMELY CLOSE TOLERANCES—CENTRALIZED PUSH BUTTON CONTROLS—AND DESIGN FOR THE GREATEST CONVENIENCE OF THE OPERATOR.

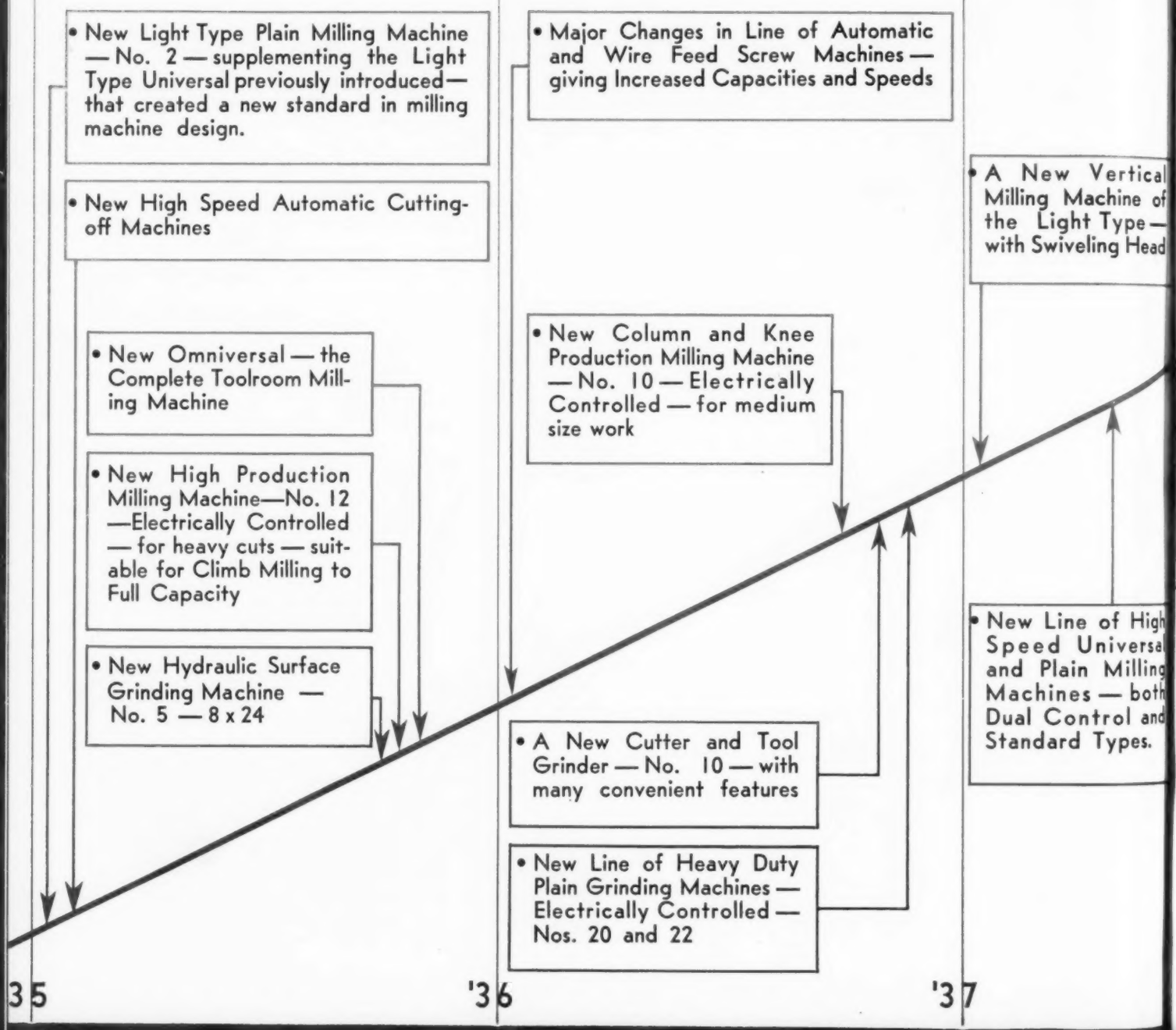
Let us help you solve your modernization problems.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOL CORPORATION

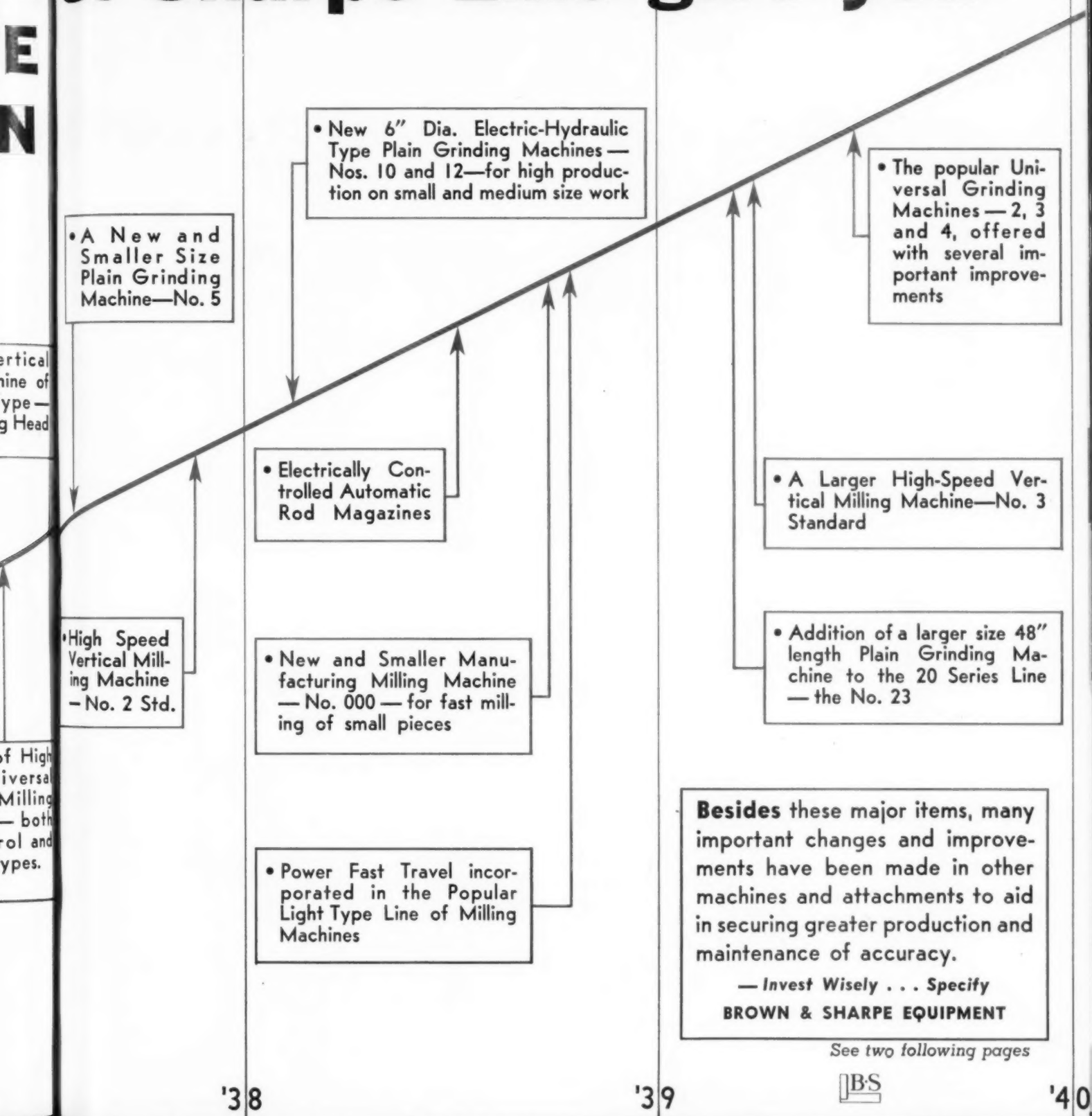
ROCHESTER, NEW YORK

. . . . . Five Years of in the Progressive Brown & opportunities for MORE PROFITABLE PRODUCTION


• New Light Type Plain Milling Machine — No. 2 — supplementing the Light Type Universal previously introduced — that created a new standard in milling machine design.
• New High Speed Automatic Cutting-off Machines
• New Omniversal — the Complete Toolroom Milling Machine
• New High Production Milling Machine—No. 12 —Electrically Controlled — for heavy cuts — suitable for Climb Milling to Full Capacity
• New Hydraulic Surface Grinding Machine — No. 5 — 8 x 24
• Major Changes in Line of Automatic and Wire Feed Screw Machines — giving Increased Capacities and Speeds
• New Column and Knee Production Milling Machine — No. 10 — Electrically Controlled — for medium size work
• A New Cutter and Tool Grinder — No. 10 — with many convenient features
• New Line of Heavy Duty Plain Grinding Machines — Electrically Controlled — Nos. 20 and 22
• A New Vertical Milling Machine of the Light Type — with Swiveling Head
• New Line of High Speed Universal and Plain Milling Machines — both Dual Control and Standard Types.
'35
'36
'37

BROWN &

Continual Developments & Sharpe Line give you


• New 6" Dia. Electric-Hydraulic Type Plain Grinding Machines — Nos. 10 and 12—for high production on small and medium size work
• The popular Universal Grinding Machines — 2, 3 and 4, offered with several important improvements
• A New and Smaller Size Plain Grinding Machine—No. 5
• Electrically Controlled Automatic Rod Magazines
• A Larger High-Speed Vertical Milling Machine—No. 3 Standard
• High Speed Vertical Milling Machine — No. 2 Std.
• New and Smaller Manufacturing Milling Machine — No. 000 — for fast milling of small pieces
• Addition of a larger size 48" length Plain Grinding Machine to the 20 Series Line — the No. 23
• Power Fast Travel incorporated in the Popular Light Type Line of Milling Machines
'38
'39
'40

Besides these major items, many important changes and improvements have been made in other machines and attachments to aid in securing greater production and maintenance of accuracy.

— Invest Wisely . . . Specify
BROWN & SHARPE EQUIPMENT

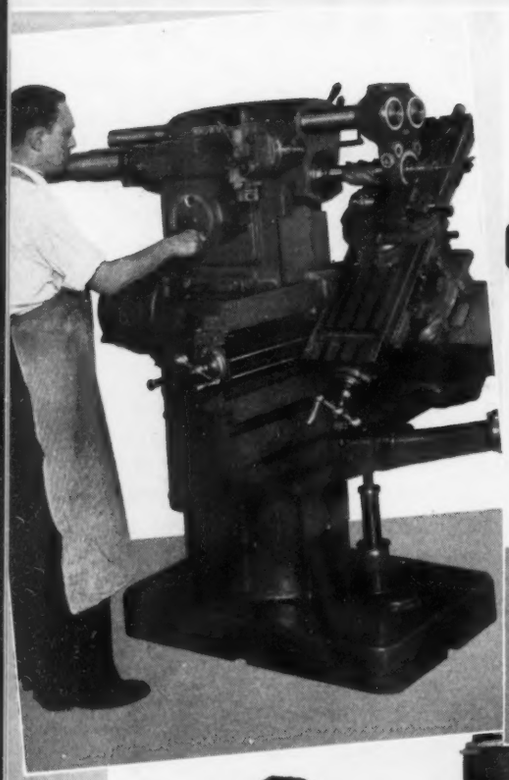
See two following pages

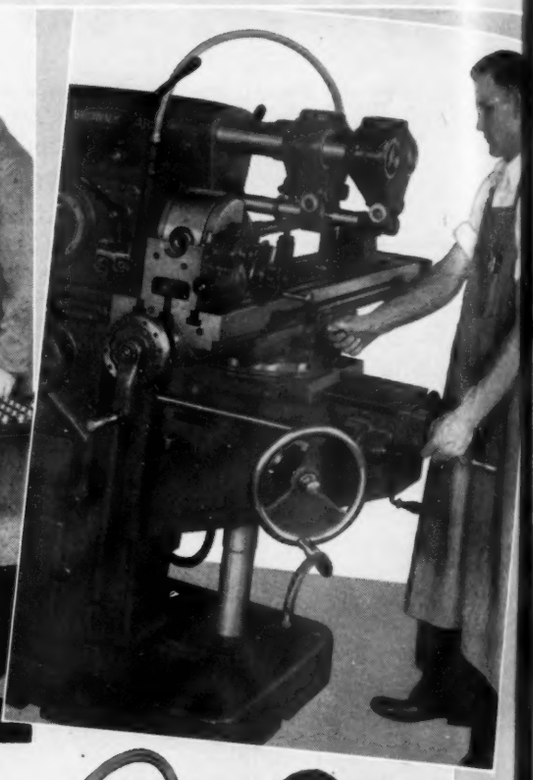
B·S

SHARPE

— PART OF MODERN BROWN & SHARPE EQUIPMENT

. . . . . ALL TO GIVE USERS

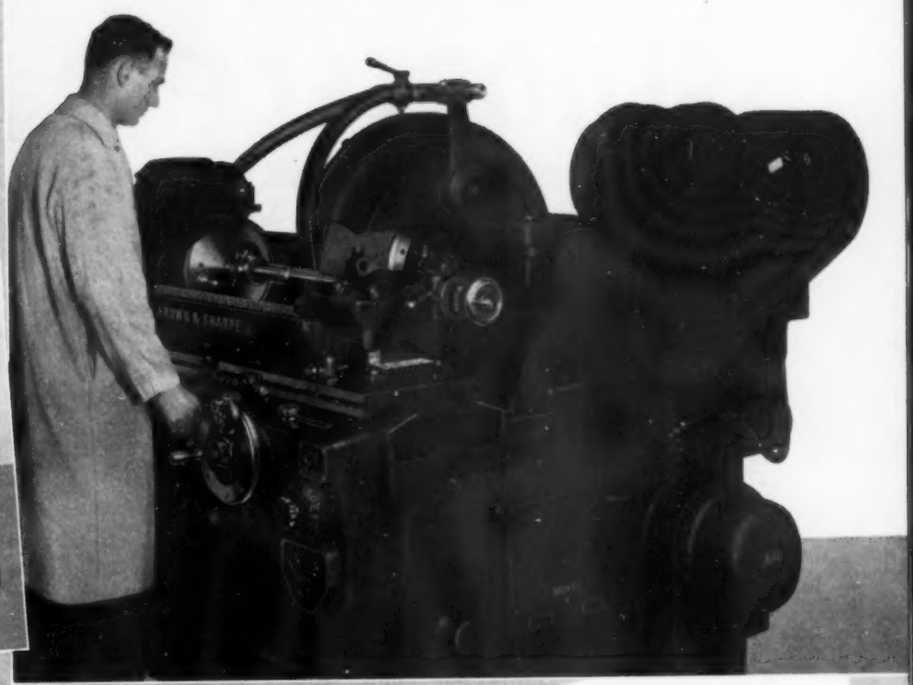




B·S

BROWN &

DEVELOPED DURING THE PAST 5 YEARS
MORE PROFITABLE PRODUCTION



Investigate the opportunities that the present-day Brown & Sharpe Equipment offers in lowering costs and improving accuracy in the manufacture of **your** product. We'll gladly give details so that you may make a comparison with your present shop equipment.

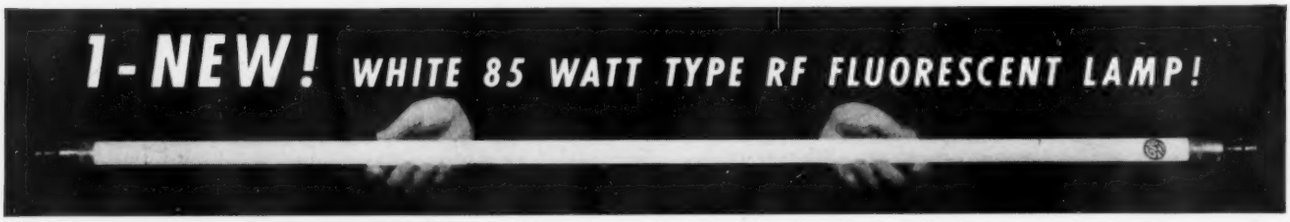
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

BROWN & SHARPE

General Electric announces

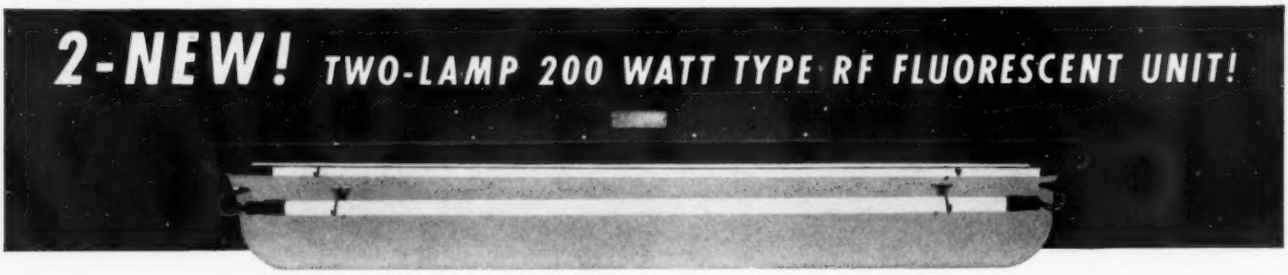
2 NEW DEVELOPMENTS IN FLUORESCENT LIGHTING OF IMPORTANCE TO INDUSTRY!

1-NEW! WHITE 85 WATT TYPE RF FLUORESCENT LAMP!



Ready for delivery May 1st is General Electric's new White 85 watt type RF Fluorescent lamp. This lamp, using 100 watts overall, is similar to the present Blue-White 85 watt RF Fluorescent lamp. In fact the two lamps may be used interchangeably in the same fixture. However, the color of the new White lamp more closely resembles natural daylight than does the Blue-White lamp. For this reason, the White lamp will prove pleasing and practical for many industrial applications, particularly where color discrimination is important. Both lamps provide high levels of industrial illumination and have long life and low operating cost.

2-NEW! TWO-LAMP 200 WATT TYPE RF FLUORESCENT UNIT!



Also ready for delivery May 1st is General Electric's new Two-lamp 200 watt Type RF Fluorescent unit. This was especially designed for the industrial field to fill a long-felt need for a single unit that produced a large quantity of light at high efficiency.

The complete unit includes two 85 watt RF Fluorescent lamps, and a fixture (reflector and auxiliary) which consumes 30 watts, making a total of 200 watts for the whole unit. Because this new unit operates on the rectified principle, stroboscopic effect is practically eliminated. When equipped with Blue-White lamps, this new Two-lamp unit produces about 8500 lumens, and nearly as much when equipped with the new White lamps.

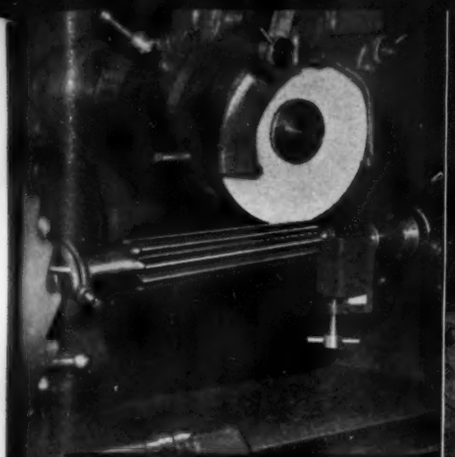
Call on **GENERAL ELECTRIC**
for better than daylight in INDUSTRY

EFFICIENT . . . ECONOMICAL . . . DEPENDABLE . . . FLEXIBLE

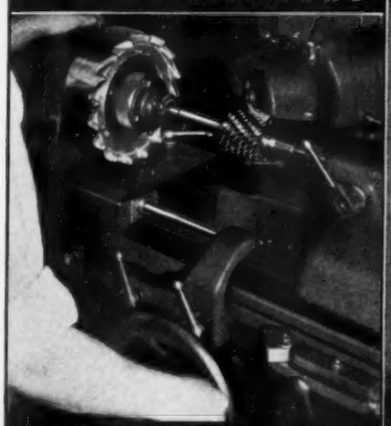
TEAR OUT THIS COUPON FOR USEFUL INFORMATION

General Electric Company, Dept. 166 AC-E Nela Park, Cleveland, O. Please send me your new bulletin with information about the New White 85 watt Type RF Fluorescent lamp and the New Two-lamp 200 watt type RF Fluorescent unit.

Name.....
Company.....
Street.....
City.....*State*.....



SHARPENS REAMERS

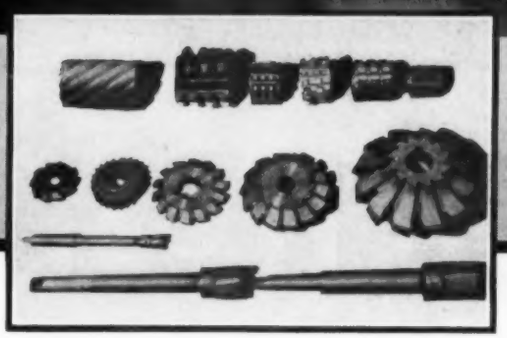


SHARPENS HOBS

ONE Machine Does the Work Required of THREE!

SHARPENS MILLING CUTTERS

BARBER-COLMAN COMBINATION SHARPENING MACHINE Is Tops For Accuracy . . .



This versatile machine provides an economical method for sharpening hobs, milling cutters, and reamers. It is designed for the small or average size shop where this work appears in small quantities. The average cutter or hob may be resharpened in 15 to 20 minutes and the machine economically justifies itself in shops having a minimum of 6 hours of this work a day.

Cutting tools may be resharpened with precision accuracy. The machine is very easy to set-up and to change from one job to another. Positive mechanical control assures the duplication of original tool efficiency which has far reaching effects such as economy of long tool life, maximum number of pieces per grind, accurately finished parts, and the reduction of spoiled work.

A Barber-Colman representative will be glad to tell you more about this machine and its use on your work. Will you ask him to call?

BARBER B-C COLMAN

PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

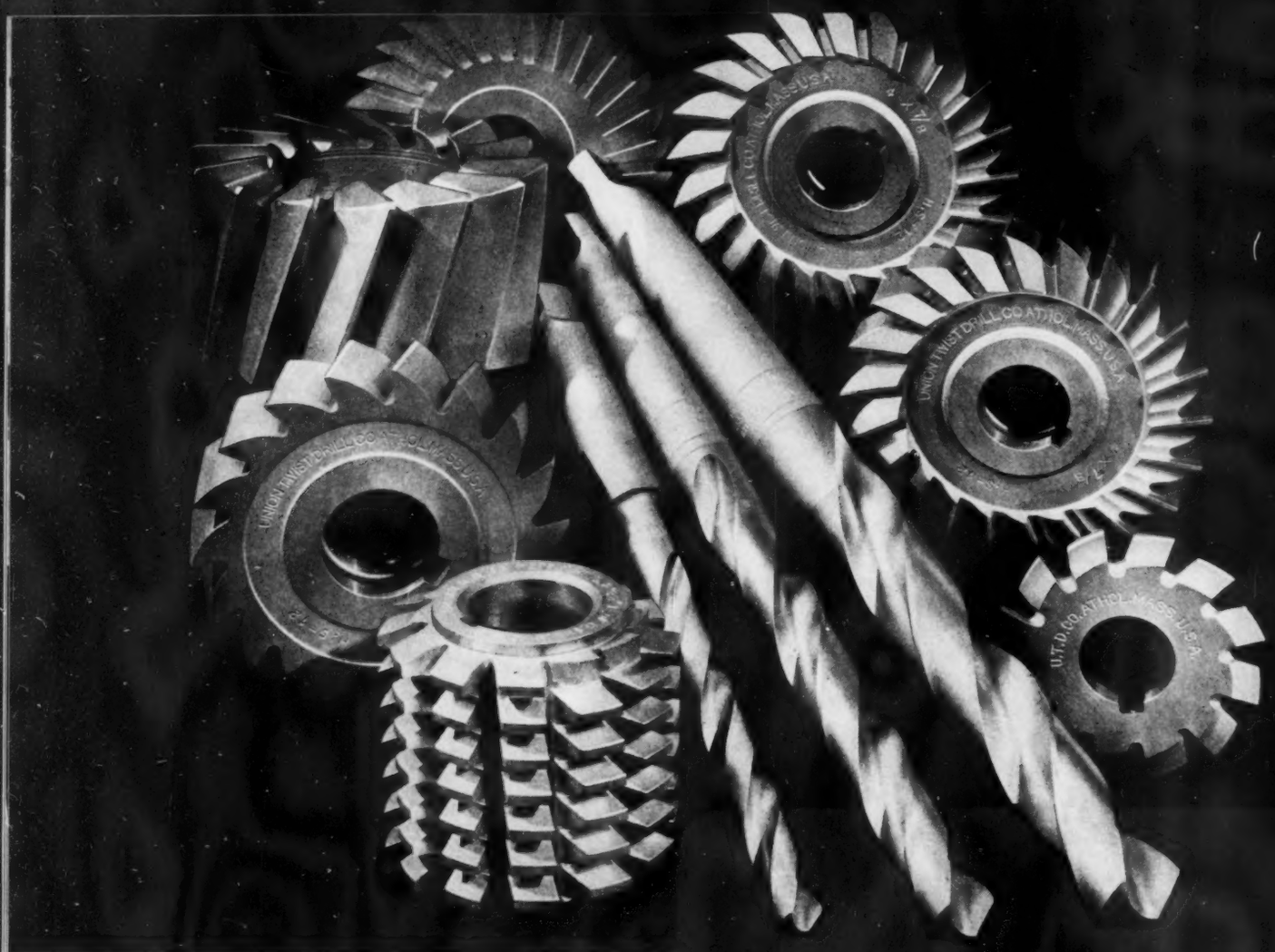
For example, the illustration above shows a typical group of cutting tools used by a manufacturer of power transmission equipment. They include hobs, spiral cutters, and reamers—all of which are sharpened on their Barber-Colman Combination Sharpening Machine.

The operator said, "The tools now stand up longer because they are sharpened right."

Write today for your copy of Barber-Colman Bulletin 1486, which fully describes and illustrates advantages of the Combination Sharpening Machine for reamers, hobs, milling cutters. It contains 29 illustrations of distinctive features and typical set-ups.

Barber-Colman Company

General Offices and Plant 201 Loomis St., Rockford, Illinois, U. S. A.



UNION

"The Tools
You Buy Again"

Try them! Put Union Tools to the actual test and let results prove their precision, their rugged construction, their ability to bring greater efficiency to the toughest jobs.

Try Union Tools and you'll see at once why—in thousands of shops—they are the standard for small tool performance. Prompt deliveries from any one of the stores listed below.

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co., Div., Mansfield, Mass.
Butterfield Div., Rock Island, Quebec.
Butterfield Div., Derby Line, Vt.

UNION
BUTTERFIELD
S. W. CARD

DIVISIONS of the UNION TWIST DRILL COMPANY

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

The CARD Quality

Performance in your plant is the only basis on which to judge true tap value. So let the Card Service Test be your guide! Put Card Taps to work alongside your present tools. Comparative performance records will prove that Card gives you the most for every threading dollar.

S. W. CARD MFG. CO.
MANSFIELD, MASS., U. S. A.

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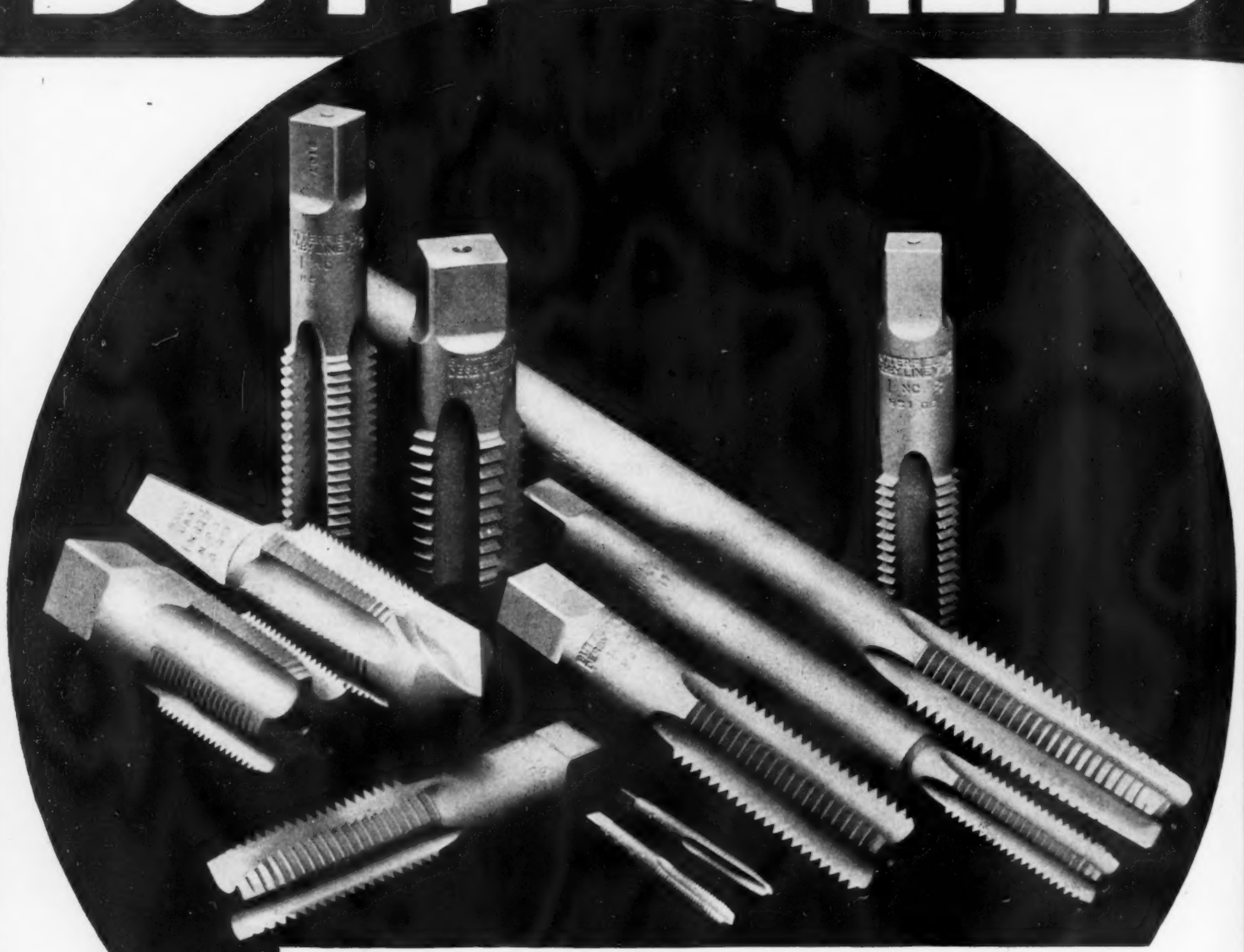
San Francisco, 121 Second St.
Los Angeles, 524 E. Fourth St.
Seattle, 500 First Ave., South

BUTTERFIELD



What phase of thread production interests you the most? . . . Costs? Longer service, built into Butterfield Taps by our metallurgical experts, keeps tool costs down . . . Production? Butterfields are made with an extra margin of strength—they'll stand up under the pace set by modern high-speed machines . . . Accuracy? There are Butterfield Taps for producing any class of accuracy you wish, up to tolerances within .0005 inch.

BUTTERFIELD DIVISION
Derby Line, Vermont—Rock Island, Quebec

UNION
BUTTERFIELD
S. W. CARD

DIVISIONS of the UNION TWIST DRILL COMPANY

FACTORIES: DERBY LINE, VERMONT—ATHOL, MASS.—MANSFIELD, MASS.—ROCK ISLAND, QUEBEC, CANADA

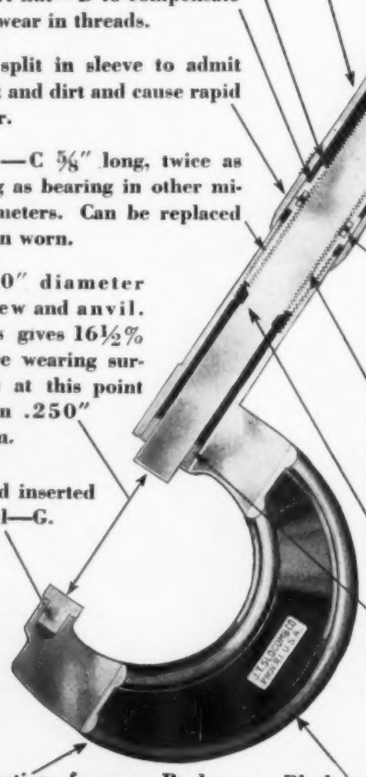
A census can be very revealing. For example, a census of machine tools would show that many of the lathes in operation today were around the shop when you and I were answering the census of 1930 and 1920. Unlike human beings, lathes do not get better with age. Modern American Industry is modernizing because it needs the finer turning precision, faster speeds, greater operating ease, and automatic features incorporated in every LeBlond lathe.

Take a census in your own plant. Keep competition on the run by running out the old, running in the new LeBlonds.

THE R. K. LEBLOND MACHINE TOOL CO.
Cincinnati, Ohio

Recognized . . . THE WORLD OVER . . A

MODERN FEATURES OF SLOCOMB MICROMETER CALIPERS



Arrangement of nuts insuring long bearing in spite of wear.

Short nut—D to compensate for wear in threads.

No split in sleeve to admit dust and dirt and cause rapid wear.

Nut—C 5/8" long, twice as long as bearing in other micrometers. Can be replaced when worn.

.270" diameter screw and anvil. This gives 16½% more wearing surface at this point than .250" diam.

Solid inserted anvil—G.

I section frame—B drop forged from bar steel.

Decimal equivalents stamped on thimble.

F—Thimble.

Nickel silver spring E. Gives uniform tension on screw.

Adjusting nut—C to overcome wear on anvil or screw. Replaceable, giving entirely new bearing for screw.

One piece hard tool steel screw—A.

Accurately fitting bushing—H insures close fit for screw. Replaceable.

Black enameled or polished frame.

SLOCOMB MICROMETER SETS Nos. 22 and 28

Set #22 is made up of 12 micrometers and 11 end measures which will measure work from 0—12", by .001; or furnished, when desired, to measure from 0—300 mm. by 1/100 mm. Set #28 (not shown) consists of 12 micrometers and 11 end measures measuring from 12"-24" by .001; or supplied, when desired, to measure from 300–600 mm. by 1/100 mm.

Other standard micrometers furnished to measure from 24"–60" or 600 m/m—1500 m/m.

SLOCOMB MICROMETER CALIPER No. 22

Measures all sizes from 0 to ½ inch by thousandths. Available with plain or friction stop. Light in weight and convenient to carry. Weighs only 1¾ oz.—a small, sturdy instrument of high accuracy. Made also in metric graduations.

...R··AS THE STANDARD···

SLOCOMB

···by which modern precision measuring is judged···

Up-to-date methods of checking tolerances to high degrees of precision are as much a part of modernization programs as the use of modern, high production, accurate machines. Only instruments that can be depended on for super-accuracy in long, hard service can meet the rigid requirements of the modern shop with its demands for inspection to closer and closer limits.

Slocomb Micrometer Calipers have been time tested for half a century in shops the world over —in tool rooms—on production lines. The word "micrometer" invariably suggests the name "Slocomb"—an association of ideas that has made Slocomb instruments a standard of comparison in precision measuring.

SLOCOMB SNAP GAUGE MICROMETERS

Time savers which eliminate guesswork in inspection or production. The necessity for handling a wide variety of snap gauges is avoided by the use of these instruments. Work can be gauged as it progresses. Made in sizes from 0-1" to 11"-12"; metric graduations available from 0-25 mm. to 275-300 mm.

SLOCOMB CENTER DRILLS

These tools are available in either carbon or high speed steel in Center Drill, Combination Center Drill and Bell Type Center Drill types. Sizes: Center Drills from ⅛ to 1"; Combination and Bell type from ⅛ to ¾".

SEND FOR THE COMPLETE 112-PAGE SLOCOMB CATALOG

Ask for catalog No. 18 giving full detailed information on the complete SLOCOMB line—sent FREE to any machinist, inspector or shop man. No obligation is incurred in sending for this valuable handbook on modern methods of checking close tolerances.

J.T. SLOCOMB CO. PROVIDENCE RHODE ISLAND

For Modern Tool Rooms . . .

NORTON MOUNTED POINTS ~

For all types of die grinding and other tool room jobs there's a complete line of Norton Mounted Points and Mounted Wheels—from the smallest to the largest in a wide variety of shapes. The cutting material is Alundum abrasive and the spindles are stainless steel.

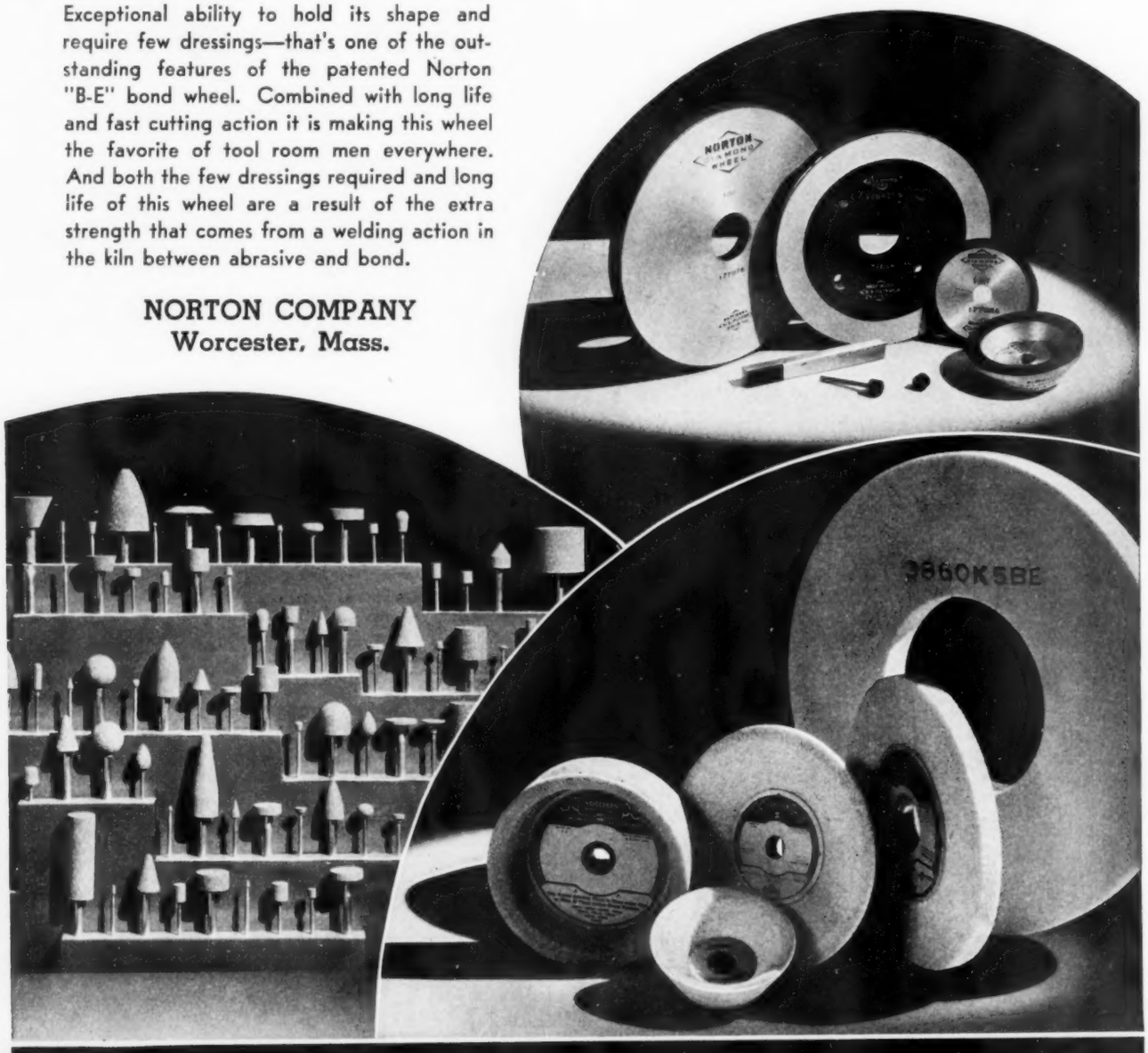
THE NORTON "B-E" WHEEL ~

Exceptional ability to hold its shape and require few dressings—that's one of the outstanding features of the patented Norton "B-E" bond wheel. Combined with long life and fast cutting action it is making this wheel the favorite of tool room men everywhere. And both the few dressings required and long life of this wheel are a result of the extra strength that comes from a welding action in the kiln between abrasive and bond.

NORTON DIAMOND WHEELS ~

For grinding the cemented carbides there are two outstanding Norton Diamond Wheels—the Resaloy Wheel and the long lived Metal Bonded Wheel—each with distinctive features. Together they make it possible to meet the individual requirements of any cemented carbide tool grinding job.

NORTON COMPANY
Worcester, Mass.



NORTON ABRASIVES

THE MODERN H-W WAY

BRINGS LABORATORY STANDARDS OF PRECISION

To Your PRODUCTION LINE and TOOL ROOM . .

IN TAPPING

To modernize tapping operations with "Hanson-Process" Taps is to achieve keener, cleaner cutting and faster work at lower cost and at the same time maintain the utmost accuracy in tapped holes.

When you examine a "Hanson-Process" Tap closely, you'll be impressed with the fine keen quality of the cutting edges—edges that maintain their sharpness longer between grinds because in the "Hanson-Process" finishing after hardening insures their perfection and long-lived precision.

When you have satisfied yourself that "HANSON-PROCESS" Taps look keener and when you've gaged them for accuracy in lead, angle and diameter—put them to work. After all, results count in the long run—and a work-out on a tough tapping job will be final and convincing proof that you can depend on "HANSON-PROCESS" Taps for superior tapping performance at big savings over the best you can realize with ordinary taps.

Select your taps from H-W Precision Tool Catalog which will be sent on request. You'll find many opportunities for modernizing your tooling in this catalog—Taps, Gages, Hobs. Multiple Thread Milling Cutters and other tools which will speed your production and cut your costs. Write for a copy TODAY!

THE HANSON-WHITNEY MACHINE COMPANY
HARTFORD, CONN.

HANSON-WHITNEY

DOMESTIC REPRESENTATIVES

MACHINERY and SMALL TOOLS—New York, L. C. Bigelow & Co., Inc.; Rochester, A. G. Brice; Pittsburgh, William K. Stamets; Detroit, Berry Thomas; Houston, Wessendorff, Nelms & Co.; Los Angeles, A. C. Behringer.

MACHINERY ONLY—Philadelphia, Lloyd & Arms, Inc.; Cleveland, William K. Stamets; Chicago, Marshall & Huschart Machinery Co.; Dayton, Seifreat-Elstad Machinery Co.; Cincinnati, Seifreat-Elstad Machinery Co.

SMALL TOOLS ONLY—Philadelphia, General Tool Sales Co.; Cleveland, George A. Whalon; Chicago, M. Ray Pearce; Minneapolis, E. Willard Pennington; Dayton, George Langen, Jr.; Cincinnati, George Langen, Jr.

"THE OLD SHOP ISN'T WHAT

TEXROPE DRIVES CUT

IT USED TO BE *But*

IT'S MAKING MORE MONEY!"

And It's Doing it with TEXROPE...the Drive that Cuts Transmission Costs!

"THEY WERE singing 'There'll Be a Hot Time in the Old Town Tonight', and the boys were just getting back from Cuba and the Philippines the day I started to work here.

"I was as young as you . . . and I guess production methods in those days were pretty young, too. I can remember how we used to get our power from one central drive shaft that ran plumb down the center of the shop.

"But the boss changed that about a year ago. Figured that if he wanted to meet competition and keep our wages up, he'd have to do something about production costs. That's why he put in all those Texrope driven machines you see around here.

"I never knew there was so much daylight that could come streaming into a shop. And after 40 years it was a little hard to get out of the habit of hearing slapping belts and the screeching of the overhead pulleys.

"No . . . the old shop isn't what it used to be. But orders are piling in . . . we're making more money than we ever did. And Sonny, that's the reason you're starting in today on your new job!"

Texrope Points to Greater Economy!

That's the reason thousands of men are choosing Texrope V-Belt Drives . . . the modern drive that points the way to ***greater*** efficiency and ***greater*** economy.

Check the outstanding engineering features you get with Texrope Drives. Find out why Texrope Drives have sky-rocketed to number one position as the most popular way to transmit power to a machine! Texrope Division, Allis-Chalmers, Milwaukee, Wisconsin.

A 1217

Belts by Goodrich

See How These Texrope Features Save You Money!

SHORT CENTERS FOR SPACE SAVING. Texrope V-Belt Drives allow you to put your source of power close to the machine being driven. There's no waste space . . . no unsightly shafts to keep out light.

INDIVIDUAL DRIVE PRINCIPLE CUTS POWER COSTS. When each machine has its own drive, you only pay for power costs when it is producing. In contrast . . . where a group of machines is coupled to a line-shaft . . . only one might be running . . . but power used is out of proportion to actual needs.

FLEXIBILITY OF LAYOUT . . . EASY TO INSTALL. You don't have to change over machines or existing layouts to fit Texrope V-Belt Drives. They'll operate in practically any position without losing their efficiency . . . and they're easy to install.

SAFETY . . . EASILY AND ECONOMICALLY GUARDED. You eliminate danger spots when you install Texrope Drives. Because of their short centers, it's easy to slip a small, inexpensive guard over them.

SHOCK-PROOF FEATURE PROTECTS MOTOR AND MACHINE. Texrope Drives do not vibrate . . . actually absorb shocks even when the load is a pulsating one. Lower belt pull means longer bearing life . . . less service and maintenance costs.

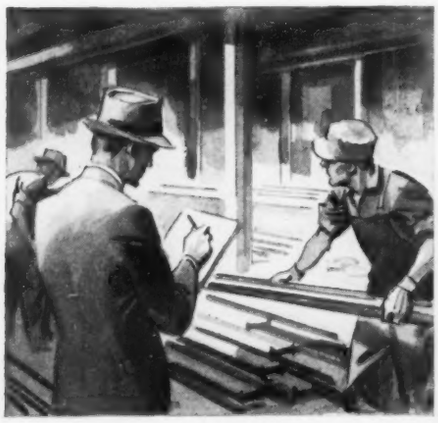
EFFICIENCY HIGH . . . MAINTENANCE LOW. With Texrope Drives, transmission losses from motor to machine are cut to a minimum. There's no belt slip . . . no unnecessary wear and tear on belts . . . no need for belt dressing.

★ADEQUATE STOCKS ARE CARRIED THROUGHOUT U. S. A. Get Texrope Drives and replacements instantly from Allis-Chalmers warehouses and dealer stocks in all parts of the country.

TRANSMISSION COSTS

ARRIVING TIME:
1 HOUR:
35 MINUTES!

1. "AT 11:50 A.M. recently we received an order for 10 plates and one angle to be cut. Customer specified material must be in Jersey City at 1:30 P.M. the same day."



2. "THE MATERIAL was trucked from our Newark Warehouse to Jersey City—10 miles distant—arriving at 1:25; one hour and 35 minutes after the order was placed."

THOUSANDS of customers have discovered that when an emergency arises Scully is always ready to meet it with service to match the occasion. And our customers have also found out that regular orders receive the same prompt, courteous attention. Each of our 8 warehouses operates on the principle that our customers always want immediate delivery—we hurry whether you ask us or not.

The next time you order steel or steel products, why not call Scully and discover why "Scully Service" is famous the country over? And ask for a free copy of our handy 1940 Stock List and Reference Book.

The Mark of Quality — USS Scully Service — *The Mark of Service*

SCULLY STEEL PRODUCTS COMPANY

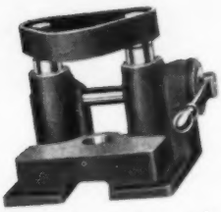
Distributors of Steel, Steel Products, Copper and Brass

Warehouses at CHICAGO • NEWARK, N. J. • ST. LOUIS • BOSTON
ST. PAUL-MINNEAPOLIS • CLEVELAND • PITTSBURGH • BALTIMORE

UNITED STATES STEEL

PROPER TOOLING *with* "CLEVELAND" SERVICE

will modernize your production



Type "A" Jigs—made in fourteen sizes—require only approximately four seconds loading and unloading time. Can be used for many different operations by merely changing top plate.

Type "SA" Jigs for use primarily on index tables—substantial and rigid fixtures of compact design, adaptable to a wide variety of purposes.

Type "B" Jigs—made in seven Standard sizes—capable of handling a great variety of work. Work is clamped tightly up against the top plate.

An important part of "Cleveland" Service is to determine whether or not replacements of old tooling methods will be justified in a limited period of time—in increased production, better work and greater profits. When modern tooling is available which can be proved as justifying a change, present equipment on the job is obsolete—and you are paying for improved production without getting it.

Leading shops in the metal-working industry have availed themselves of "Cleveland" experience and "Cleveland's" recommendations on proper tooling to realize outstanding savings in production—savings that have paid for tool modernization over and over again.

Each one of the typical Cleveland Universal Jig products shown has been designed and developed to meet a specific production problem and render a high net return on its use. These tools have been constantly improved over a period of more than twenty years and offer the most advanced methods for the low cost, accurate, high productivity in the operations for which they are employed.

We maintain a large stock of tools at all times and can handle special requirements promptly.

Ask our Engineering Department for assistance in modernizing your tooling.

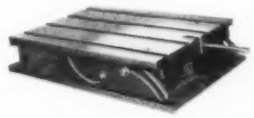
•

WRITE FOR A FREE COPY..

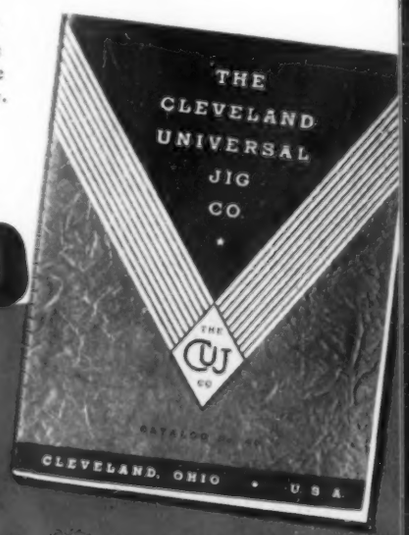
of our new catalog No. 40 containing valuable information on modern tooling. Kindly use your company letterhead in writing for a copy.

Type "AF" Cam Jigs—adaptable to almost any tooling job—simple with positive and solid clamping—Locking action takes place near the end of stroke—locking range is indicated on plunger with two lines.

Index Tables—meeting most exacting demands—standard sizes from 8" to 48" diameter—in plain and water rim types in high and low styles—special tables to meet special requirements.



Adjustable Angle Plates—made in four standard sizes—combine a precision angle machining or checking plate with a rugged production fixture. Tee slots provided for holding work.



CLEVELAND

The UNIVERSAL JIG COMPANY

CLEVELAND, OHIO, U.S.A.

MODE

With Sundstrand Rigidmils...

Sundstrand Rigidmil
Cuts Costs on 22 Jobs . . .
Production Increases
Average 157% . . .
The Sundstrand No. 0 Rigidmil illustrated has four pairs of 4" diameter face-mills for machining

Sundstrand Rigidmil
Holds Plunge Cut To ±0.001"
Close-stop and dwell equipment of Rigidmil illustrated holds depth of keyseats in small crankshafts to ±0.001". Powerful, smooth hydraulic feeds, and high spindle-speeds, mill keyseats quickly, work cutters to capacity safely. Rapid traverse of 325" cuts the time between cuts to a

Rigidmil accuracy, speed, power, convenience and versatility cut costs, increase production, save floor space, or otherwise benefit balance sheets of users. Adaptability, another notable Rigidmil characteristic, enables Sundstrand engineers to quote extremely attractive figures on production milling to meet special requirements. Designed and built in our own plant, the Sundstrand Hydraulic Equipment of Rigidmils centralizes responsibility, assures reliable operation and highly efficient economical performance.

Typical examples of Rigidmil versatility, economy, and high productive capacity are illustrated on this page. Note the headlines. Write to Sundstrand Engineered Production department for complete information. Send drawings and data on your milling jobs for reliable production and cost estimates. Modernize with Sundstrand Rigidmils.

Bulletins 382 and 383, shown at left, have illustrated descriptions of Rigidmil features, advantages, cycles, and other important details. Write for your copies, *today*.

SUNDSTRAND MACHINE TOOL CO. · ROCKFORD, ILLINOIS U.S.A.

RIGIDMILS-
Tool Grinders—Drilling & Centering Machines

RNIZE

With Sundstrand Automatic Stub Lathes

The ease with which Sundstrand Automatic Stub Lathes can be set-up, and the speed with which they can be changed from one job to another by simple adjustments; are characteristics which increase output, improve operation, simplify machining, and give more work for less money. Their unit construction gives you most economical and efficient combinations of tool movements for immediate requirements; and enables you easily to extend the wide range of application still further at any future time. Investigate, today. Let Sundstrand Engineered Production figure on your turning requirements. Modernize with Sundstrand Automatic Stub Lathes.

SUNDSTRAND MACHINE TOOL CO.
2533 Eleventh Street, Rockford, Illinois, U. S. A.

STUB LATHES

Hydraulic Operating Equipment
Special Machinery

SUNDSTRAND MACHINE TOOL CO. S ROCKFORD, ILLINOIS, U.S.A.

Unique features, advantages, cycles, construction details, and specifications of Models 8, 10, and 12 Automatic Stub Lathes are illustrated and described in Bulletin 391 shown above. Write for your copy today.

Modernizing HEAVY DUTY SERVICE IN A BIG WAY!

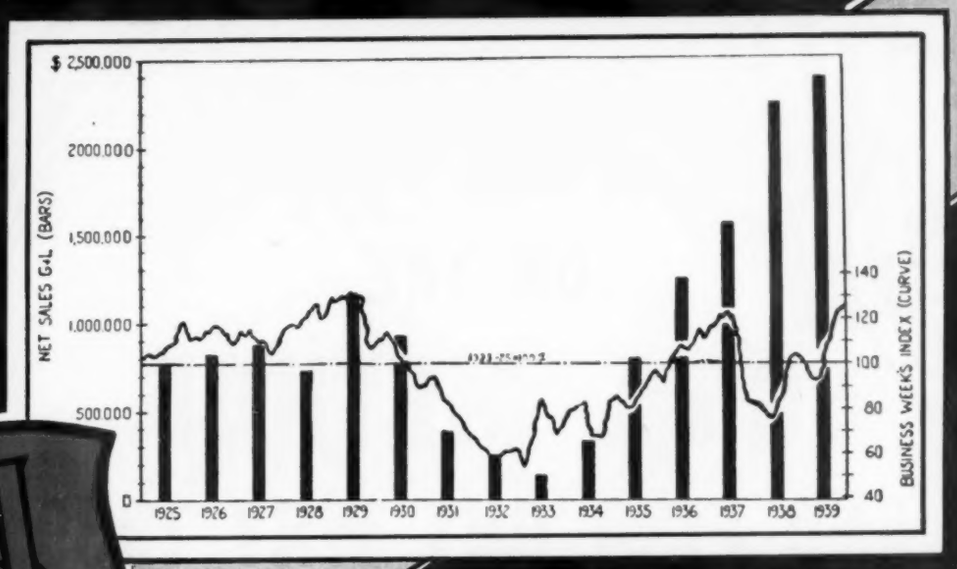
● Big in size, ruggedness, and job capacity, but offering the same simplicity in control and operation of smaller machines, this new member of the King line will go a long way toward handling your big operations with utmost accuracy and economy. Also modern machines ranging from 30" . . . full details on request.

The New KING 10 FT. VERTICAL BORING AND TURNING MACHINE

The KING MACHINE TOOL Company

Builders of Vertical Boring and Turning Machines Exclusively

CINCINNATI • • • OHIO



Business Activity Curve . . . **BUSINESS WEEK**

GIDDINGS & LEWIS

SALES CURVE PROJECTED AGAINST THAT OF BUSINESS – SHOWS: —

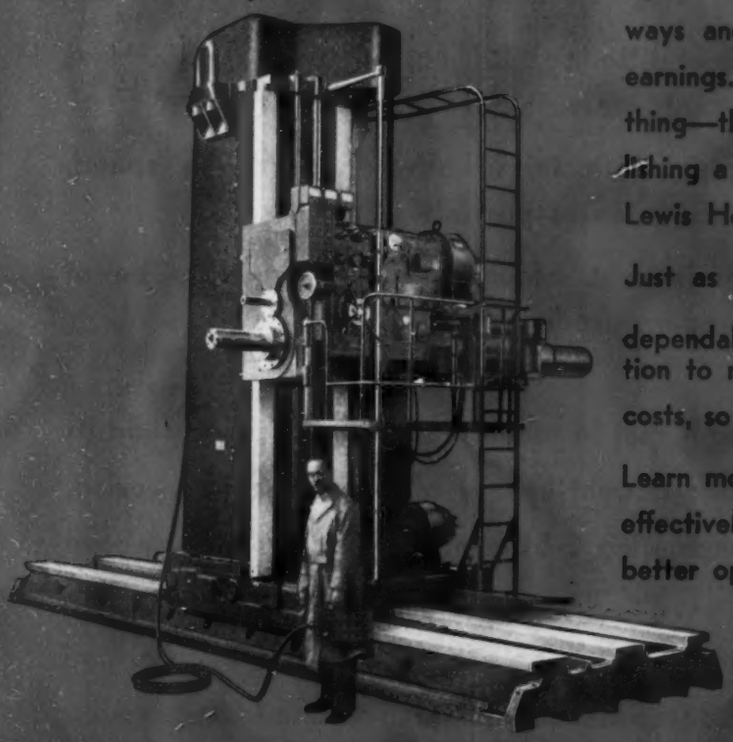
1. That more G&L Horizontal Boring, Drilling, and Milling Machines have been sold in recent years than ever before.
2. That metal working plants are taking advantage of the speed, economy, and quality G&L makes possible.
3. That the new features in G&L Machines have proved to be of exceptional value in modern production.

★ It is interesting to note by above graph that in recent years, when industry did its big modernization job, metal working plants bought heavily of G&L horizontal boring, drilling, and milling machines. The bars indicating G&L annual sales, extend far above the business activity curve beginning with 1935. The year to year increase, beginning with this date, shows unusual acceptance of the G&L Method and the continued increase shows how users find the G&L Method a dependable modernization answer.

Get the Facts

ON THE G & L METHOD AND FIND OUT WHY 1939 WAS THE BIGGEST YEAR IN G & L SALES · ·

New 50 Series 560-F Floor Type. Six inch main spindle. Two and one-half inch auxiliary spindle. Ninety-six inch head stock travel, auxiliary spindle. Ninety-inch travel on runway.



★ In these days of increasing costs, business does look for ways and means of offsetting these additional burdens on earnings. The chart you have just looked at does prove one thing—that metal working plants have put the job of establishing a better profit opportunity directly up to Giddings & Lewis Horizontal boring, drilling, and milling machines.

Just as other G&L users have found the G&L Method a dependable answer in shaving the costs of present production to recover money that goes to meet various increased costs, so is the same opportunity available to you.

Learn more about the G&L Method—see just why G&L can effectively help you in speeding up production, in making better operators out of your men, in gaining better quality results, and in cutting the cost of doing each job.

THE MORE G & L USERS ------

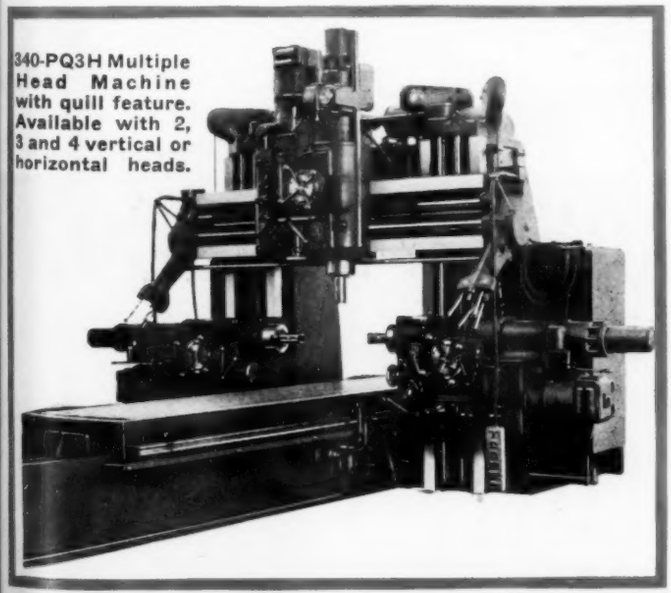
The Greater Acceptance of the G & L METHOD is your answer to IMMEDIATE MODERNIZATION NEEDS

Some of the Latest

G & L TYPES TO AID METAL WORKING PLANTS

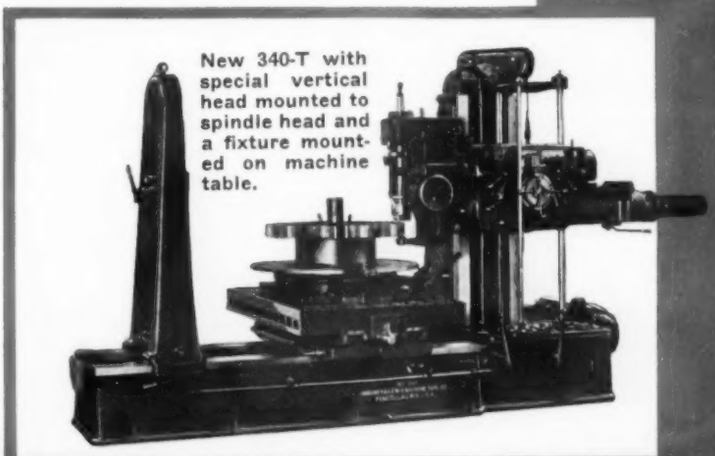
The G&L Machines you see on this page carry on with the long established G&L benefits—ultra-precision—real rigidity—ease of operation—versatility. Investigation of the many types of G&L Machines will show you that each has special G&L features, that each feature is of particular importance to you in terms of savings, that each feature makes those jobs of yours easier to do.

To fully provide for today's production demands, to meet the extreme accuracies required for high output, to operate with greater economy than ever before—find out how you can apply a G&L to your needs and get these results.

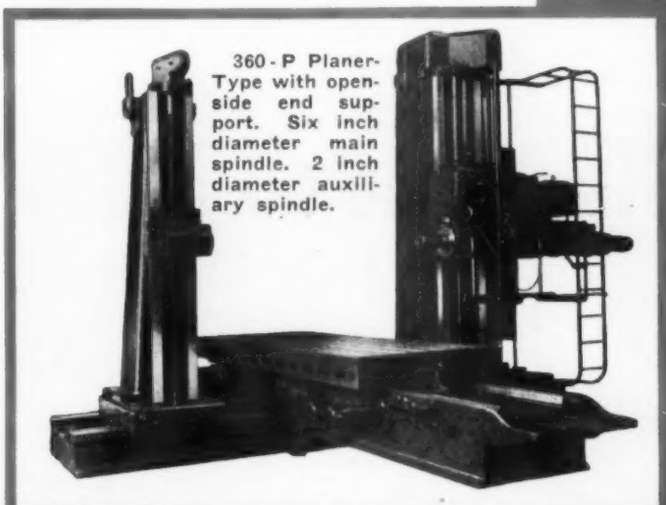


340-PQ3H Multiple Head Machine with quill feature. Available with 2, 3 and 4 vertical or horizontal heads.

New 30 Series 340-RT with built-in combination hand and power feed revolving table.



New 340-T with special vertical head mounted to spindle head and a fixture mounted on machine table.



360-P Planer-Type with open-side end support. Six inch diameter main spindle. 2 inch diameter auxiliary spindle.

THE MORE G & L BOOSTERS

MORE G & L SALES BECAUSE USERS GET ACCURACY AND SPEED WITH LESS TOOL SPOILAGE, REDUCTION OF WORK SPOILAGE, AND OPERATORS SUFFER LITTLE FATIGUE . . . .

THERE IS A PROPER TYPE G & L FOR YOUR NEEDS

Machines built in Table, Floor, Planer, and Multiple Head Types with main spindle diameters ranging from 2½" to 8" inclusive.

TABLE TYPE MACHINE: either standard design or with special adaptation of machine with extra long cross travel when carrying heavy castings.

MULTIPLE HEAD MACHINE: these machines can be furnished with two, three, and four vertical and horizontal heads.

PLANER TYPE MACHINE: Horizontal Boring, Drilling, and Milling Machine of the Planer type with adjustable column. With large planer table, it is ideal for machining large Diesel engine frames.

FLOOR TYPE MACHINE: obtainable with conventional type head or with bore spindle sliding in an adjustable quill. The adjustable quill is a big advantage on floor type machines for setting large milling cutters.

GET THE COMPLETE G & L STORY

The G&L Method is showing remarkable savings wherever it has been put into operation. Get full particulars on any of the G&L Machines or adaptations of new G&L design to accommodate your own particular requirements. Send us prints of your castings or tell us the kind of work you have and we shall be glad to outline the possibilities of one of our machines on your type of work. Descriptive bulletins covering every type of G&L machine, engineering recommendations, and G&L service are offered to manufacturing executives in the United States and all foreign countries. If you wish, a G&L representative will gladly call and give you all of the facts on the G&L Method.

Some OF THE G & L FEATURES THAT MAKE IT POSSIBLE TO EARN BETTER PROFITS

1. Time saving with DEPTH GAGE
This device eliminates considerable measuring on the part of the operator and also eliminates the necessity of constant watchfulness. This results in greater speed and ends the possibility of mistakes. Rotation of the turnstile rapid traverses either the main or high speed spindle by hand. A pull on any one or several of the turnstile handles engages the power feeds—a push on top disengages them.

2. Greater accuracy with SCALES and ADJUSTABLE VERNIERS
No climbing over headstock to read scales set in column—this means safety—saves time—and insures greater accuracy. The table and headstock movements are each provided with a precision scale. The verniers are graduated to read in .001" and are adjustable so that they can be set to the nearest full inch for a starting point, eliminating a lot of decimal figuring.

3. The operator can be sure with DIRECT READING DIALS
Beneath the cover plates, geared to the rotary selectors, are dials which, through openings, show the spindle speed or feed engaged. While cranking, the operator merely watches the window until the speed or feed wanted appears. Here again is accuracy and savings in time.

4. Set-up changing saved with ROTARY TABLE
Mounted on machine table—either hand or power feed—makes it possible to do any operation on any of the four sides of a casting simply by revolving the table—the set-up of the casting remains the same—a real time saver.

5. Accuracy and speed thru HAND ADJUSTMENT
A slow hand feed with micrometer adjustment is applicable to spindles through a hand wheel at front of head. This hand adjustment of spindles is one of the many G&L features that pay in larger profits.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

HORIZONTAL
★ BORING
★ DRILLING
★ MILLING
MACHINES

WANT THIS KIND OF MOTOR PERFORMANCE IN YOUR PLANT?

Read These Interesting True Case Histories of How Allis-Chalmers Lo-Maintenance Motors are Providing Long-Life . . . Low-Cost Motor Service to Industry!

GET THIS type of up-to-date motor performance in your plant . . . and assure yourself long motor life plus low maintenance . . . with Allis-Chalmers Lo-Maintenance Motors.

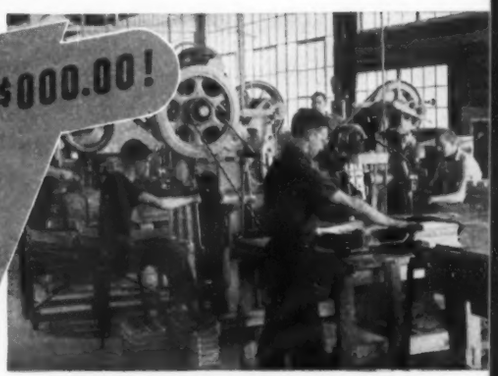
For, in Lo-Maintenance Motors, you get such "full-measure" features as—distortionless, twistless stator . . . indestructible, removable rotor . . . high carbon steel frame . . . no skimping anywhere on materials or workmanship!

These are important features . . . designed to give you motor performance that is more than just a rated horsepower. Let the engineer in the district office near you explain them to you. Call him . . . today. Or write Allis-Chalmers, Milwaukee.

A 1241

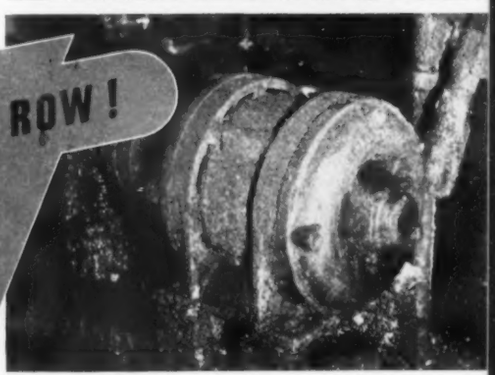
8½ YEAR REPAIR BILL-$000.00!

In this Cincinnati factory, 119 Allis-Chalmers Lo-Maintenance Motors have gone more than 8½ years without one cent spent for repairs . . . typical of Lo-Maintenance money-saving performance.



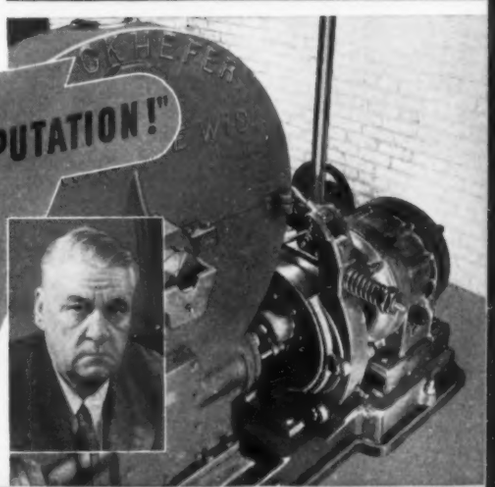
5 YEARS ON SUICIDE ROW!

Not a pretty picture! But this Lo-Maintenance Motor was running perfectly five years after it was installed on "suicide row" in this chemicalplant, where adverse operating conditions wrecked other motors in 60 to 90 days!



"HELP PROTECT OUR REPUTATION!"

"Allis-Chalmers Lo-Maintenance Motors help us protect our reputation as builders of elevators that won't break down"—says E. F. Kieckhefer, vice-president, A. Kieckhefer Elevator Company.

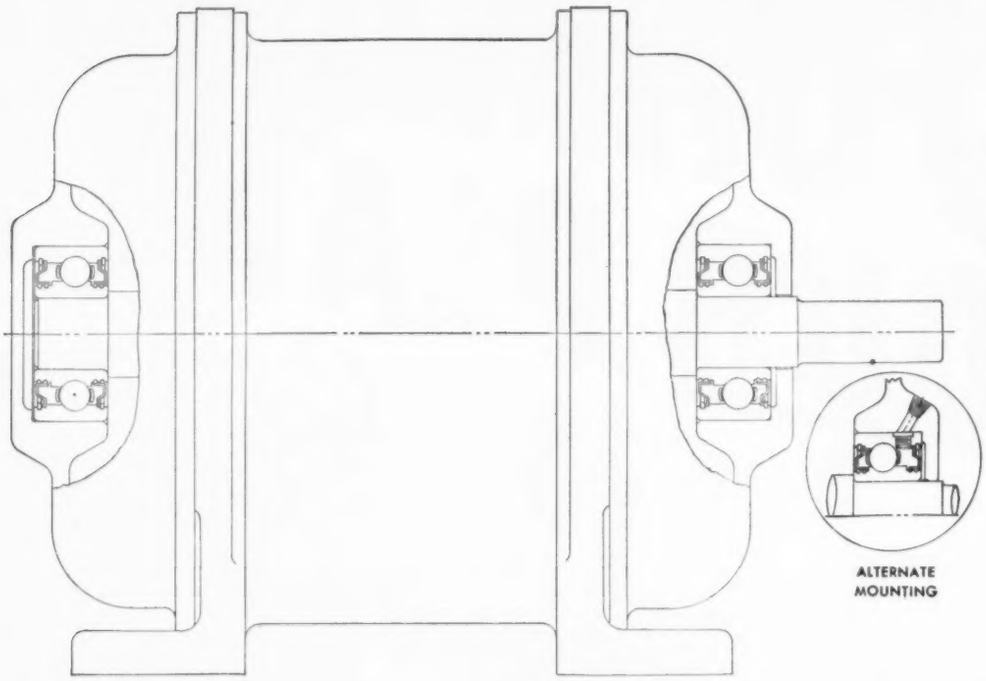


Over 90 Years of Engineering Superiority Work for You When You Specify Allis-Chalmers!

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

MODERNIZE THE BEARINGS IN



THE IMPROVED

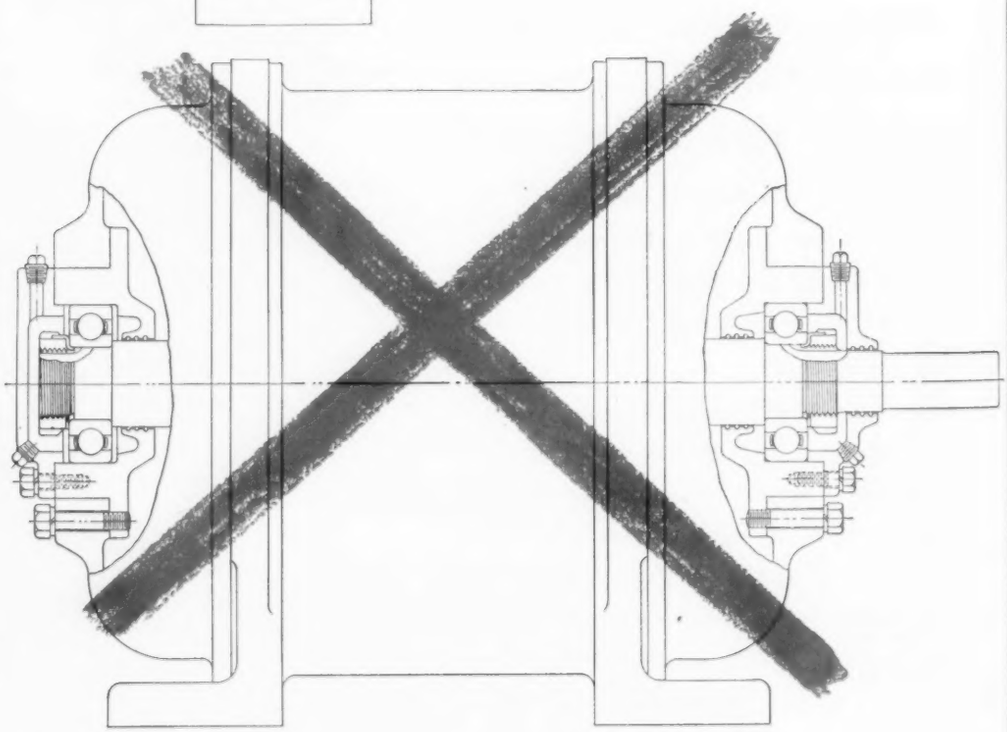
A Part Section of an Improved Motor Mounting with Ultra-Modern "CARTRIDGE" BALL BEARINGS.

THE PRESENT

A Part Section of a Typical Present-Day Motor with Unshielded Ball Bearings in the Conventional Cartridge Type Mounting.

•

See opposite page for machining operations and parts eliminated from this motor.



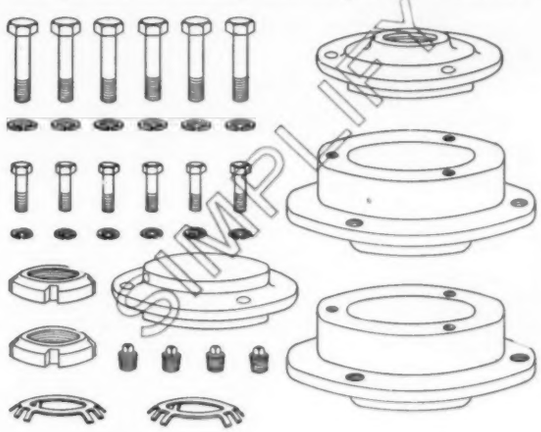
NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

USE "CARTRIDGE" BALL

YOUR MOTORS!

36 (OR MORE) PARTS ELIMINATED

Below are shown the extra parts required in the conventional cartridge type mounting. THESE ARE ALL ELIMINATED BY USING THE "CARTRIDGE" BALL BEARING,—18 parts per housing and 36 parts per motor.



30 (OR MORE) MACHINING OPERATIONS SAVED

Mounting the "CARTRIDGE" BALL BEARING in the motor housing requires only (1) Boring motor end housing for bearing, (2) Facing housing bore for bearing abutment—4 machining operations per motor.

The conventional cartridge mounting employing the unshielded ball bearing requires 30 additional machining operations per motor.

MACHINING OPERATIONS ELIMINATED

1. Drilling Motor Housing for cap screws.
2. Machining Outer Diameter of Cartridge.
3. Facing Cartridge Flange.
4. Boring Cartridge for Bearing.
5. Facing Cartridge for Cover Plate.
6. Facing Cartridge Bore for Bearing Abutment.
7. Boring Cartridge for Shaft Clearance.
8. Drilling and Tapping Cartridge for Cap Screws.
9. Machining Flange of Cover Plate.
10. Facing Cover Plate.
11. Boring Cover Plate for Shaft Clearance.
12. Drilling Cap Screw Holes.
13. Drilling and Tapping for Grease Fittings and Drain Plugs.
14. Threading Shaft for Lock Nut.
15. Cutting Keyway on Shaft for Lock Washer.

Developed expressly to improve electric motor design and performance, the "ultra-modern" "CARTRIDGE" BALL BEARING offers the following advantages:

SIMPLIFIED DESIGN: As indicated above, eliminates 36 or more parts,—each an inventory burden and potential trouble-maker. Shortens overall length of mounting and reduces overhang of shaft.

ECONOMICAL MOUNTING: Cuts out the many costly machining operations enumerated above. Assures better bearing alignment because of fewer possible variables.

EASIER AND FASTER ASSEMBLY AND DISASSEMBLY: The "CARTRIDGE" BALL BEARING is handled as an integrally sealed, single unit unencumbered by numerous complementary parts.

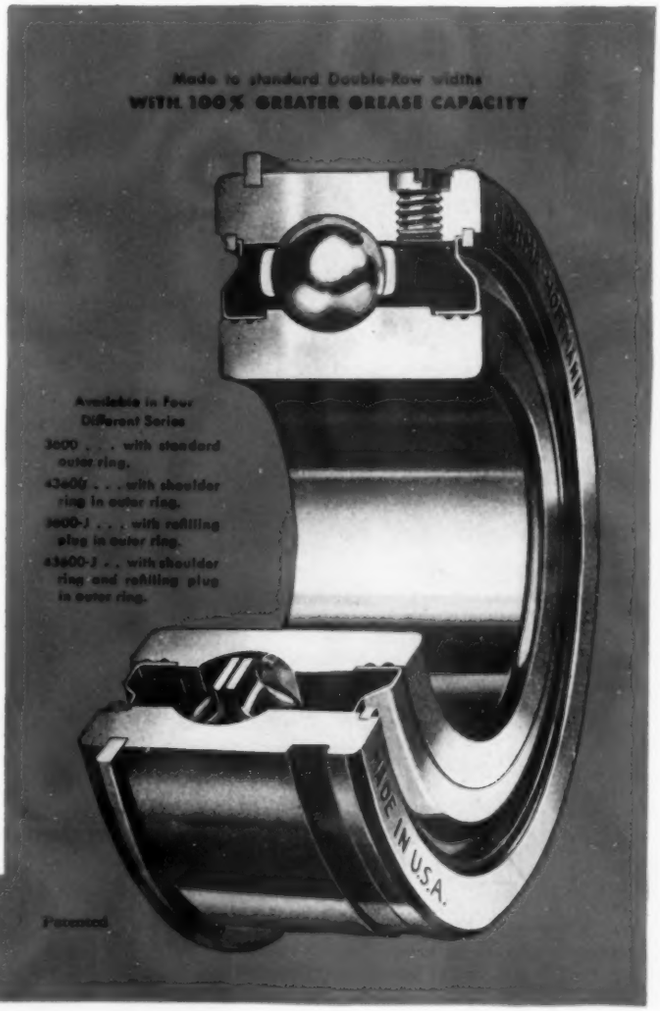
DIRT HAZARD ELIMINATED: Tightly-fitted seals prevent ingress of foreign matter during assembly, in service and when removing armature. The "CARTRIDGE" BALL BEARING comes pre-packed with clean, "stability-tested," uncontaminated grease.

SLIPPAGE, PEENING AND COCKING PREVENTED due to wider race contact area on shaft and in housing. No locking means required and elimination of threading permits use of stronger shafts.

LONGER LIFE AND LOWER MAINTENANCE, resulting from large, lasting grease supply kept in close proximity to rotating surfaces by highly efficient, wearless metal seals. No "dead" grease space and no leakage irrespective of position of motor.

REGREASING AND INSPECTION FACILITATED, refilling plug and removable seals being provided for such purposes.

Let our engineers work with yours. Write for the Catalog.

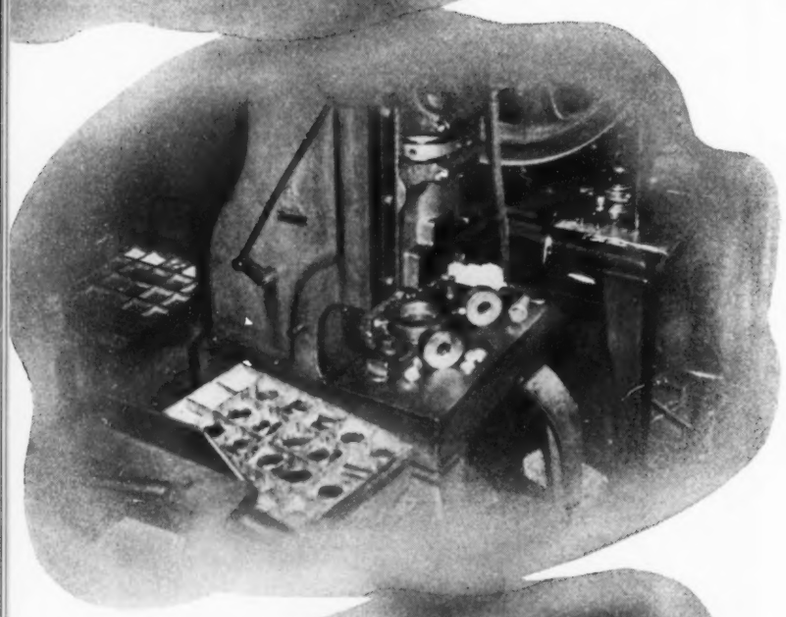

Made to standard Double-Row widths
WITH 100% GREATER GREASE CAPACITY
Available in Four Different Series
3600 . . . with standard outer ring.
43600 . . . with shoulder ring in outer ring.
3600-J . . . with refilling plug in outer ring.
43600-J . . . with shoulder ring and refilling plug in outer ring.
MADE IN U.S.A.
Patented

BEARINGS

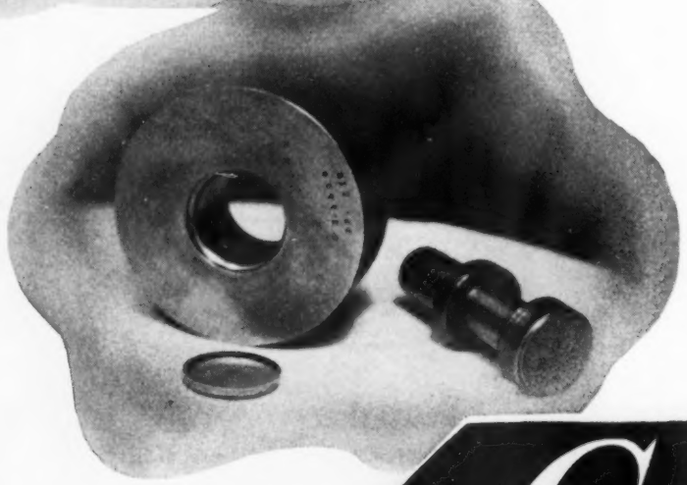
The Standard Tool Steels of Industry

You can do something about it . . .

HERE IS MUTE EVIDENCE—It takes 10 minutes to remove each of these dies from the press and replace a duplicate tool. Based on this figure, the tools waiting on this table for restoning represent approximately 800 minutes or 13⅓ hours of lost press time. In nearly all plants, dies and tools that must be removed from machine tools for repairing or regrinding account for substantial losses in output, as well as excessive tool costs.



HERE IS WHAT IT COSTS—This press runs at 200 pieces per hour, finish drawing stainless steel watch cases. With the former type of tool, ten minutes out of every two hours was lost because "loading up" required replacement of the tool. Each day forty minutes production or 133 pieces were sacrificed, plus two hours toolroom time for restoning the "loaded" tools.

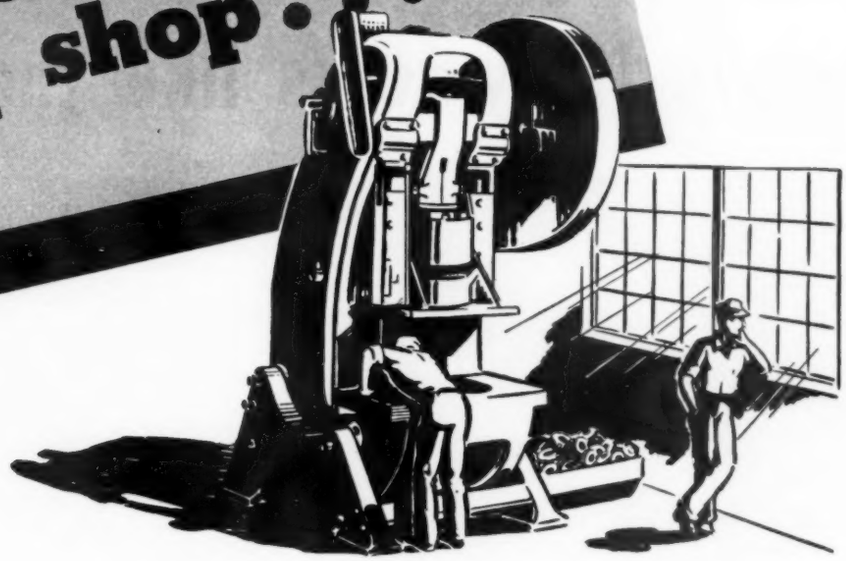


HERE IS THE SOLUTION—Carpenter's Matched Set Method of Tool Steel Selection indicated that Carpenter's slippery hard, super-wear resistant K-W tool steel would improve the situation. It was tried and shutdowns for tool replacement dropped to ten minutes out of every twenty-five hours. Lost press time per day dropped from forty minutes to three minutes. Extra production per day amounted to 123 pieces. Toolroom time saved per day amounted to one hour and fifty minutes. This example is typical of the kind of results users of Carpenter's Matched Tool Steels frequently achieve.

Carpenter

BRANCH WAREHOUSES AT—Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, Philadelphia.

There is an IDLE MAN in your shop . . .



Here's what he's doing . . .

USUALLY he operates one of your machine tools or presses, but right now he is impatiently waiting for a tool to be reground, repaired or replaced.

While he waits, output waits with him and overhead costs mount up. Worse yet, the "time-out" may be stalling production somewhere else along the line. Each time this happens, anywhere from several minutes to several hours' output is lost forever.

Yet experience shows that fully half of all equipment shutdowns traceable to tools can be avoided. For example, consider how often machines and presses are stopped because the tool "loaded up," "wore beyond tolerance," "began to strike up a burr," "scratched," or "chipped in service." How can *you* stop excessive shutdowns that result from causes like these?

SUPPOSE there was a better kind of tool steel for the job, and you had a quick and accurate way of finding it . . . *could you get longer runs and fewer shutdowns?*

SUPPOSE you had an extra margin of safety to carry your tools through heat treatment and protect them in service . . . *would this reduce your "idle tool time"?*

SUPPOSE you had better and simpler formulae for heat treating your tools . . . *could you cut your tool costs and the unit cost of your product?*

You can get all these benefits and more besides with Carpenter's Matched Set of Tool Steels and Carpenter's modern Matched Set Method of Tool Steel Selection.

The *easiest* and *quickest* way to get started is to send for your Carpenter representative who can point out where you can expect immediate benefits, and who will leave with you a complete instruction manual on how to use the Matched Set Method to your greatest advantage. Use this coupon today, or, for extra speed, wire or phone the nearest Carpenter office.

THE CARPENTER STEEL CO., READING, PA.

ACT NOW TO REDUCE PRODUCTION SHUTDOWNS! Without obligation, find out about Carpenter's Matched Set Method. Fill in and mail this coupon.

MATCHED TOOL STEELS

THE CARPENTER STEEL COMPANY
109 Bern Street, Reading, Pa.

Gentlemen:

Tell us how we can apply The Carpenter Matched Set Method of Tool Steel Selection to reduce shutdowns and cut production costs in our plant.

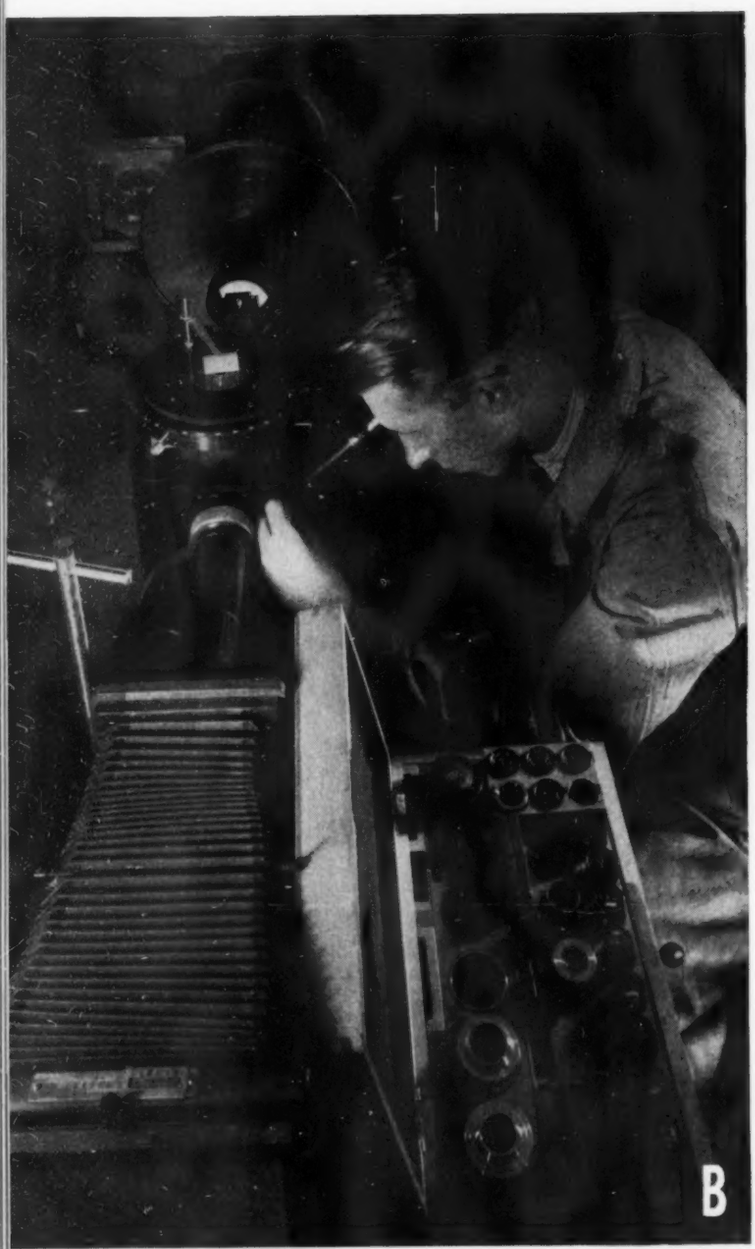
NAME..... TITLE.....

FIRM.....
(Firm Name Must Be Given)

ADDRESS.....

CITY..... STATE.....

Before we say "THIS STEEL HAS *Superior* MACHINING PROPERTIES" we prove it by tests like these



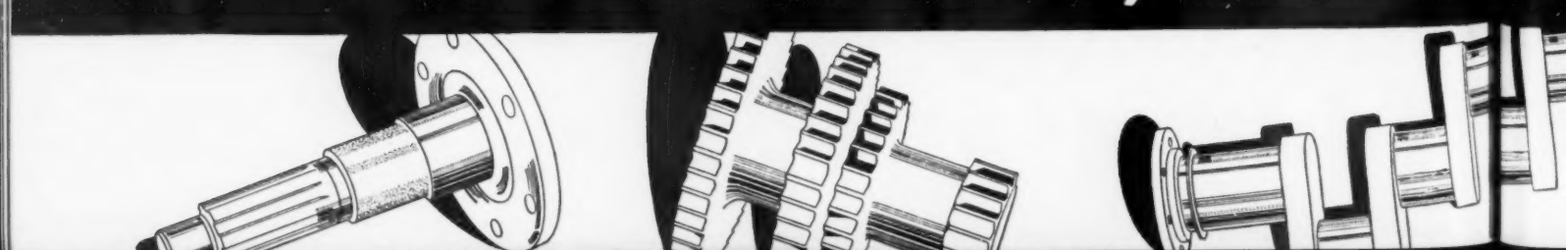
NOTHING IS LEFT TO CHANCE

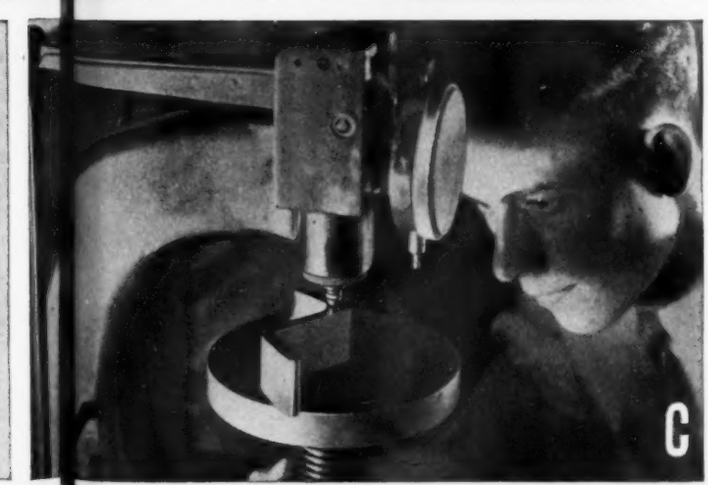
To give you the right steel that will do the best job for you—and to maintain its desirable characteristics in shipment after shipment, precise uniformity of control is exercised in every step, in every heat of U·S·S Carilloy Steel produced. It includes uniformity of selection of scrap for furnace charge, uniformity of furnace practice, uniformity of slag control, uniformity of tapping, pouring and rolling practice, and uniformly close metallurgical control, supervision and inspection throughout the above steps until the steel is delivered to your shop.

. . .

(A) This unusual lathe test is all important in studying machinability. (B) Metallographic microscope reveals facts about physical structure unobtainable in any other way. (C) Rockwell Test for hardness.

U·S·S CARILLOY *Dependable*





By digging out the facts that forecast performance, we make sure that U·S·S Carilloy Alloy Steels will function satisfactorily—in your plant and in your product.

YOU never saw a testing device quite like this. It is a development original with us—one of the busy tools in our metallurgical laboratory.

Here is a lathe fitted with ingenious control equipment, by which all operating variables during cutting are kept constant. This permits us to obtain a clear and accurate record of steel machinability.

By actually machining test bars on this equipment, we obtain invaluable comparative data on tool life and surface finish which indicate what production practices will give the user best results and the highest economy in fabrication for any particular application.

We emphasize this test because we believe it is unusual and because it illustrates how far we go beyond the routine physical and chemical check-ups to make sure that our alloy steels will exactly fill the bill for you.

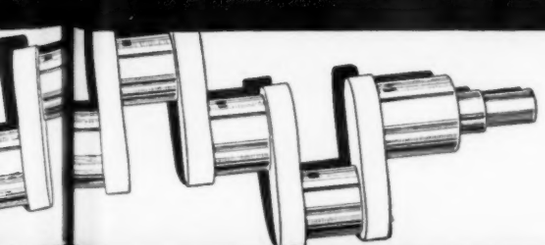
With us, the making of U·S·S Carilloy Alloy Steels is a precise and exacting process. They are produced in a plant especially devoted to alloy steels. Here, the finest and most modern equipment is matched by the skill of experienced mill and metallurgical personnel. Every step in production from furnace to final inspection is on a controlled quality basis. Each order, whether large or small, gets individual care and attention.

To be sure you get the *most* value from your steel dollar, ask our metallurgists to work out the economies of Carilloy Steels as they apply to your product.

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago

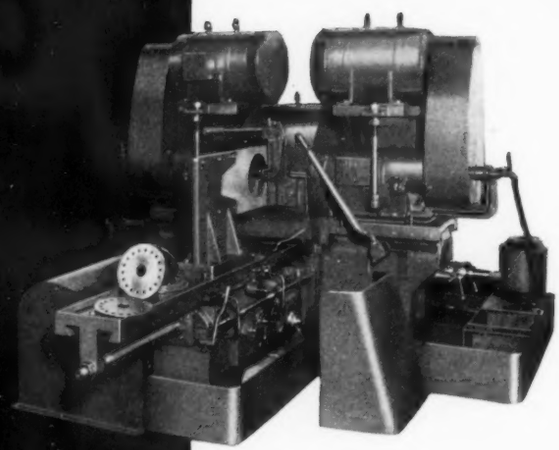
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

le **ALLOY STEELS**



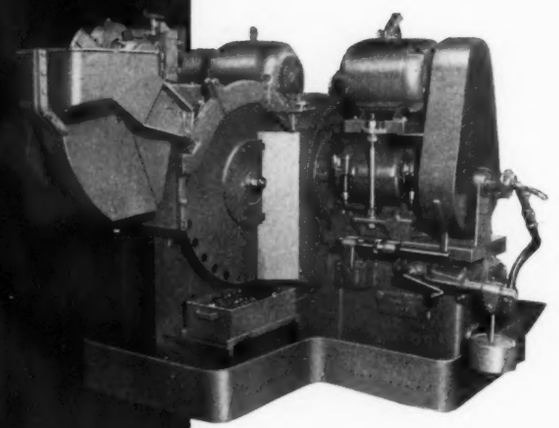
UNITED STATES STEEL

Blazin



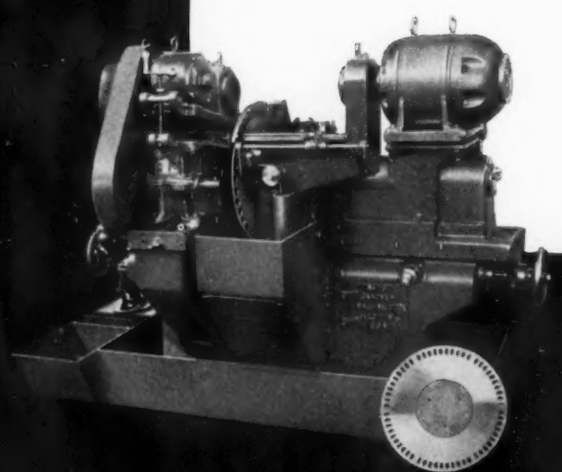
AUTOMOBILE CLUTCH SPRING DISCS. Clutch spring discs measuring 9⅜″ O.D. x ⅛″ thick, and made of high carbon spring steel, are ground at the rate of 70 TO 80 PER HOUR on this Gardner No. 120A-26″ Double Spindle Grinder. They are carried in a blade-type fixture mounted on an hydraulically-operated knee.

These discs are held within .001″ for paralleliam, and within .003″ for uniformity. Stock removal averages .006″ to .008″ over all.



VALVE SEAT INSERTS. Three No. 84-30″ Gardner Double Spindle Grinders are grinding valve seat inserts in one automobile plant.

These parts, made of a special alloy, are fed from a hopper into a rotary carrier by means of an automatic plunger, and are discharged by a simple "kick-out". They are ground at the rate of 40 TO 50 PER MINUTE, removing .015″ over all stock, and are held within .0005″ for parallelism, and .002″ for uniformity.



WATCH MOVEMENT PARTS. One of the largest watch manufacturers in the country operates two 15″ Gardner Double Spindle Grinders on tiny watch movement parts. They are ground semi-automatically, using a rotary work carrier as shown, with PRODUCTION AVERAGING 25 TO 30 PIECES PER MINUTE. This rate is based upon a stock removal of .010″ to .015″ over all.

The parts are held within .00075″ for flatness and parallelism, and within .001″ for uniformity.

GARDNER

...zing the trail in . . .

PRECISION DISC GRINDING!

TODAY, many flat surface parts—some of YOUR flat surface parts, very likely—can be ground to really surprising accuracies, upon Gardner Grinders.

On fairly large areas, like the clutch spring discs shown, tolerances of .001″ for parallelism are possible, while small areas such as the other jobs illustrated, can be held within a few "tenths".

These striking achievements, pioneered by GARDNER, have completely revolutionized the average Production Official's ideas of Disc Grinding. In less than three years, by means of heavier machines of improved design, PLUS *modern abrasive discs or wheels* (made also by GARDNER), Disc Grinding has acquired a new reputation among well-informed Shop Executives.

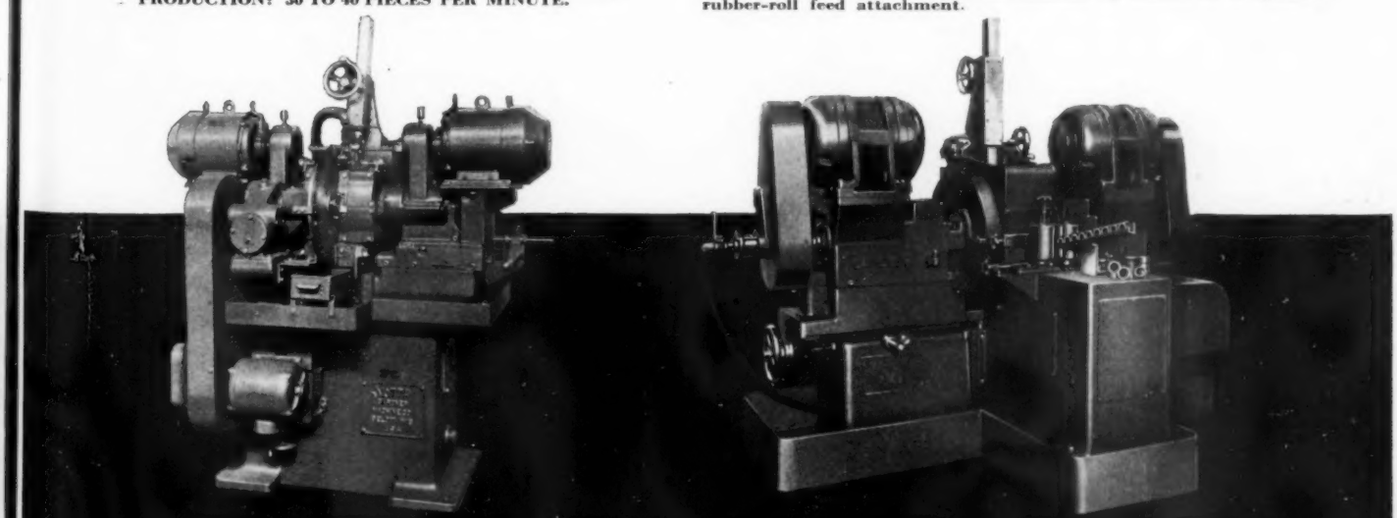
The lengthy trail leading from rough surfacing, to true PRECISION Disc Grinding, has been blazed by Gardner Engineers. Already it is being traveled by many progressive plants, which are finding it to be a short-cut to increased profits, through closer accuracies AND greater production.

Write for 24-page Booklet—"Modern Methods of GARDNER-GRINDING!"

GARDNER MACHINE COMPANY
410 East Gardner Street, Beloit, Wisconsin, U. S. A.

ELECTRIC SHAVER PARTS. Tiny insert blocks for a popular electric shaver, are ground on both sides in this 12′ Gardner Grinder, using a blade-type rotary work carrier. Stock removal, .001′ to .002′ over all; tolerances, .001′ for parallelism and uniformity. PRODUCTION: 30 TO 40 PIECES PER MINUTE.

ROLLER BEARING RACES. This huge No. 84-30′ Gardner Grinder turns out roller bearing races ground on both faces, AT THE RATE OF 60 TO 75 PER MINUTE. They are held within .0003′ to .0005′ for parallelism, and .004′ for uniformity.
These races are fed through the machine by means of a special rubber-roll feed attachment.

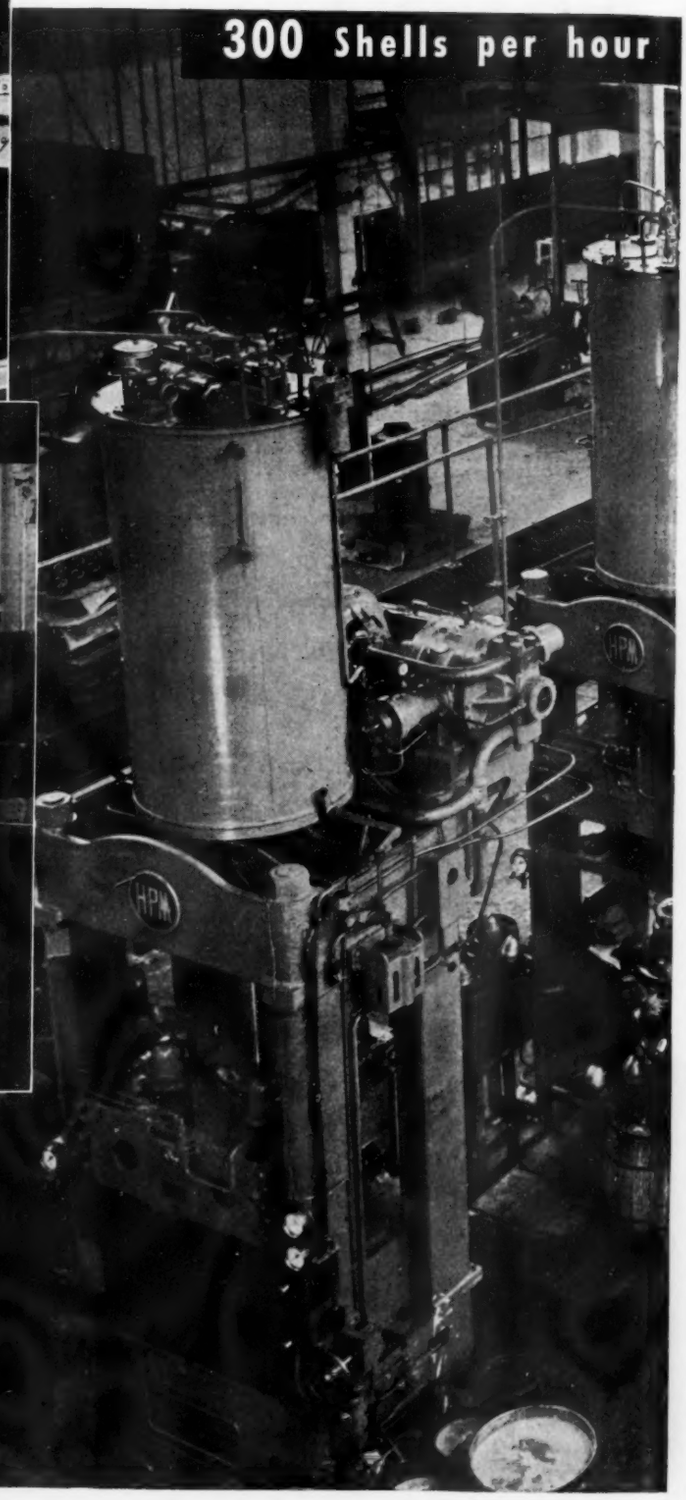


GRINDERS

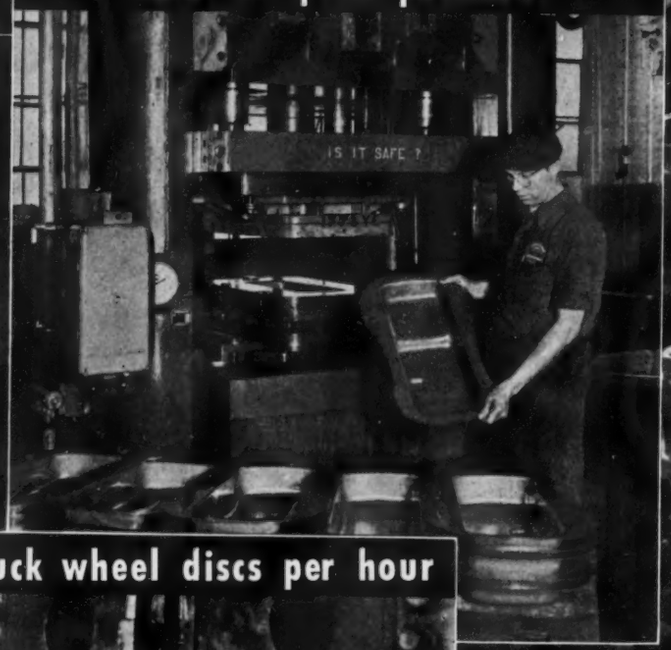
HERE'S ACTUAL PR
ON H·

300 Truck running boards per hr.

300 Shells per hour



250 Oil pans per hour

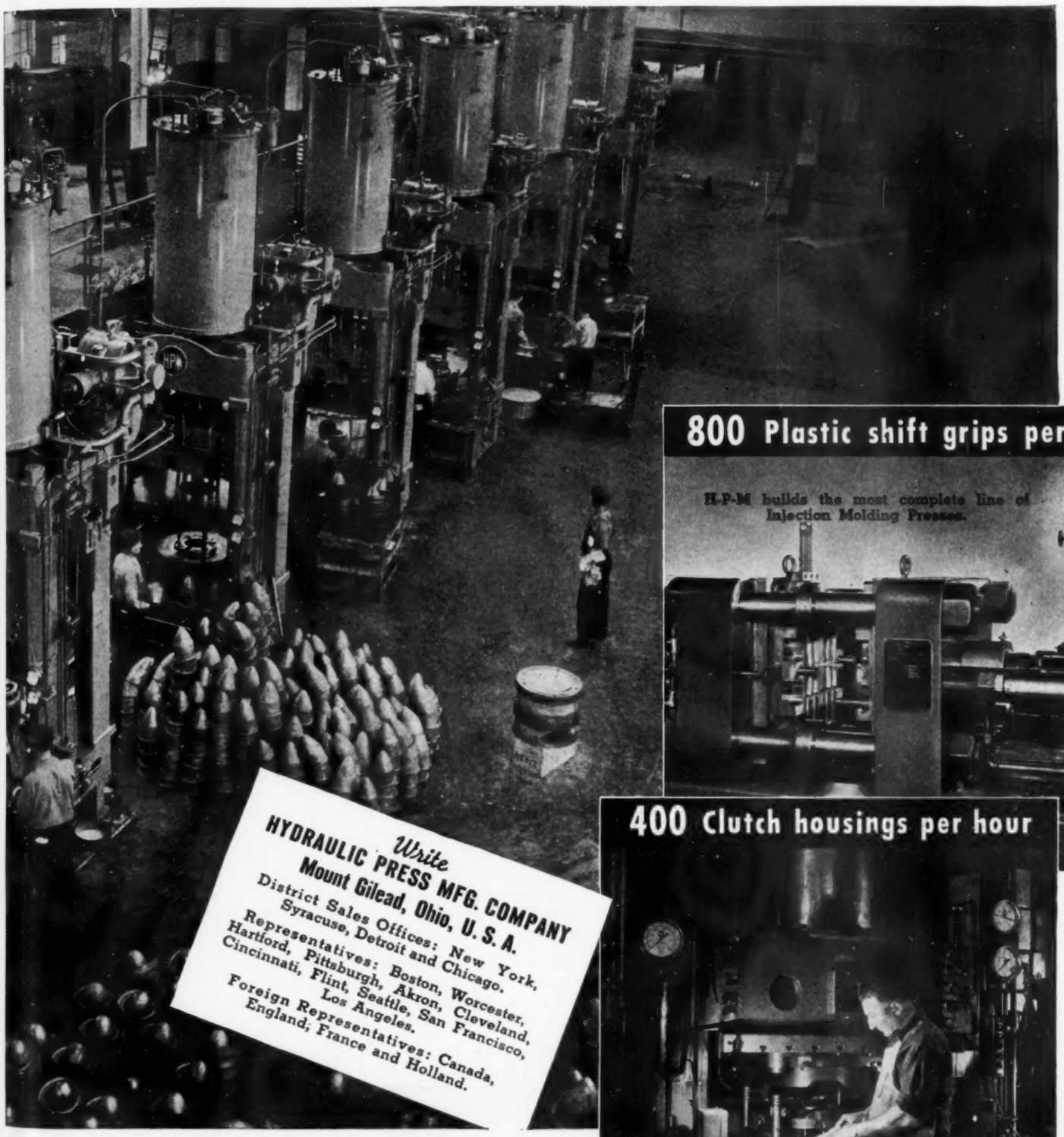


500 Truck wheel discs per hour

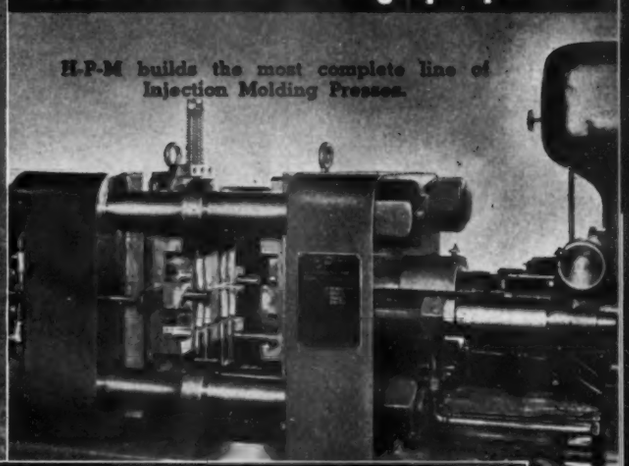
HPM FASTRAVERSE

RODUCTION

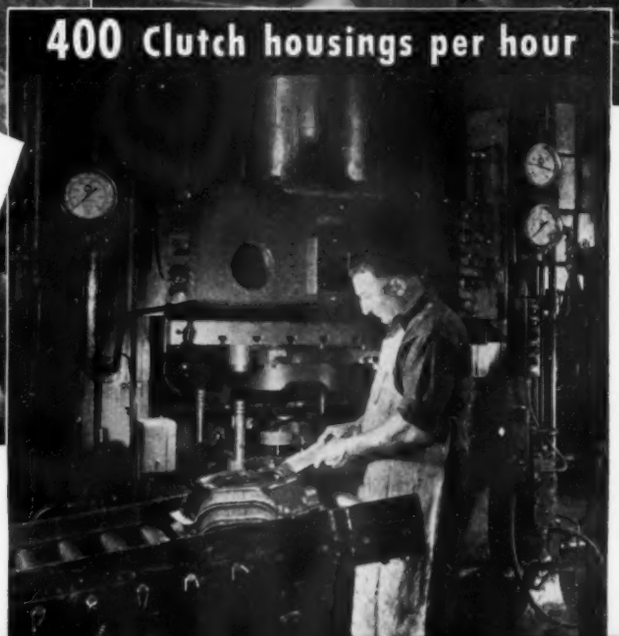
P·M PRESSES ★ ★



800 Plastic shift grips per hr.



400 Clutch housings per hour



Write

HYDRAULIC PRESS MFG. COMPANY

Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Detroit and Chicago.

Representatives: Boston, Worcester, Hartford, Pittsburgh, Akron, Cleveland, Cincinnati, Flint, Seattle, San Francisco, Los Angeles.

Foreign Representatives: Canada, England, France and Holland.

PRESSES

NEW

SLEEVE BEARING DATA SHEETS

for the

ENGINEER · · · DESIGNER METALLURGIST

● Here are valuable additions to your file folder on Sleeve Type Bearings. New data sheets on LEDALOYL self-lubricating bearings have just been produced. They will help you when deciding bearing specifications.

Sleeve bearings of today are precision-made products. They more than prevent wear and reduce friction — but definitely aid the performance of the motive unit. Accordingly, they should be designed and produced to fit the individual application. You can easily eliminate guesswork and effect marked economies in selecting your requirements by knowing what factors to consider . . . which type to select. Johnson makes this an easy matter for you. Data sheets are available on such subjects as Alloys, Lubrication, Design, and on all types as — Cast Bronze, Sheet Metal, Laminated, Self-Lubricating Bearings.

This is but one of the many plus values we offer to industry. Competent Engineers and Metallurgists are always available to study your bearing problems. As producers of *all* types of sleeve bearings, we base our recommendations solely on facts . . . free from prejudice.

Why not take advantage of this exceptional service? Write today for a copy of our file folder. And when you have a bearing problem — invite a Johnson Engineer to help you solve it. There is no obligation involved.

Ask for the Complete Set

Sleeve Bearing Data Sheets come to you in loose leaf form — all in a handy file folder. This will fit right into a standard letter file and keep valuable bearing data — right at your elbow. Write for a complete set — today.

The MOST COMPLETE SLEEVE BEARING SERVICE in the world

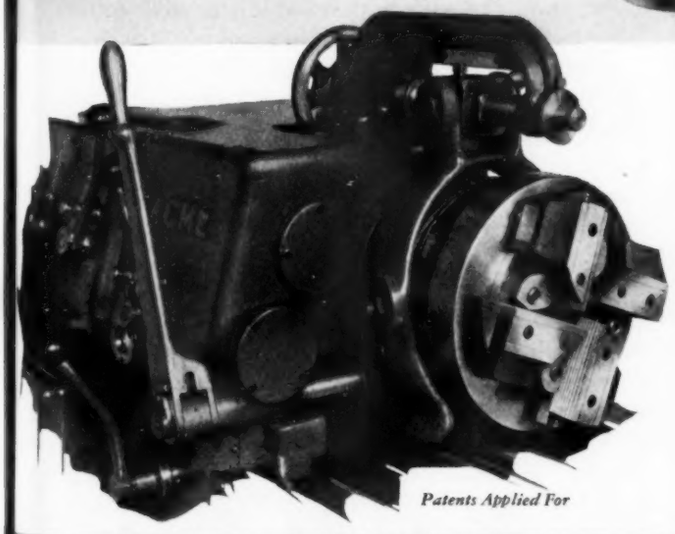
JOHNSON BRONZE COMPANY

Sleeve BEARING HEADQUARTERS

515 SOUTH MILL STREET • NEW CASTLE, PA.

A New Die Head—

MORE RIGID THAN EVER—FOR ACME MODEL "XL" THREADING MACHINES



Patents Applied For

• This new die head, now standard equipment on all Acme Model XL Threading machines, is stronger and more rigid than ever. It may be adjusted while in operation by the micrometer wheel now standard on all Acme Model XL Threading machines. All wearing surfaces are hardened and ground.

Only one set of die holders is needed for the complete range of sizes of each head. Each die holder as shown is anchored rigidly by a large diameter ground pin and by a cam-shaped clamp—a two-point gripping device that locks two adjacent die holders securely in place, an extra support to the rigidity of both. An entirely new method is provided for setting dies to cover complete range of machine. This is accomplished by eccentric adjusting blocks permitting four different approximate positions of die holders. The adjustment for exact diameter to be threaded is made by micrometer adjustment. The die clamp is flush with the side of the die, imposing no limit on how close it will thread to the shoulder of the work.

All torque is taken off the die barrel, insuring maximum power, simplicity, and accuracy of operation. This new Acme Tangent Die Head is available in these size ranges: ¼″ to 1″; ¼″ to 1½″; ⅜″ to 2″; ½″ to 3″, and in single, double and quadruple model machines. Ask for further particulars and new Catalog.

THE ACME MACHINERY COMPANY

Established 1882

4535 ST. CLAIR AVENUE

FORGING • THREADING • TAPPING

BOLT • NUT • RIVET MACHINES

Cleveland, Ohio

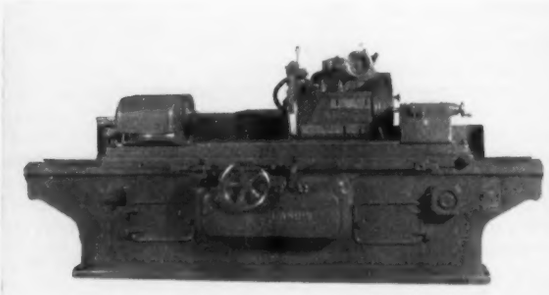
MODERNIZATION-YOUR

Disguised
BUT STILL A THIEF

Old Man Obsolescence may dress himself in the finest clothes and affect the best of manners, but underneath the finery he is still the same sly thief of time. And stealing time means stealing money.

Don't be fooled by appearance. Even though a grinder may look and seem as good as new it can very easily be obsolete—for designs change rapidly these days. One manufacturer of milling machines was requiring a total of 4620 minutes to grind 13 different spindles. Landis guaranteed to reduce the time on these to 2770 minutes, a reduction of 40%. When a new Landis 14" Type C Hydraulic Universal was installed it actually ground the spindles to an exceptionally fine finish and a close degree of accuracy in 1533 minutes, a reduction in time of 66%.

This same wise manufacturer figures a 10% depreciation on all his machine tools and *actually makes replacements every ten years.* He knows that modern equipment puts Obsolescence to flight.



LANDIS

A VALVE MANUFACTURER MAKES A DISCOVERY

There is something intriguing about making a discovery—especially if profits flow as a result of that discovery.

This was the position in which a well known valve manufacturer found himself not so long ago. He felt that his older equipment was not adequate for the turning out of an order of airplane valves which had to be delivered in a hurry. A quick investigation was made and two new Landis 6" x 18" Type C Plain Hydraulic Grinders were installed. *Production immediately increased 100%.*

Almost as important as this was the fact that the halving of the grinding time enabled the manufacturer to make much better delivery. Is it not possible that you too would discover in modern Landis grinding equipment the means of cost reduction and the better meeting of delivery schedules? No. 333

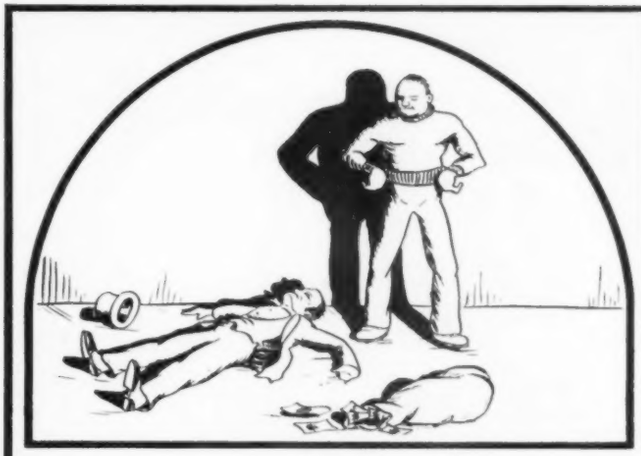
TOOL

SMARTEST INVESTMENT

MODERN LANDIS RACE-A-WAY RAISES OUT-PUT 40%

Not long ago Landis engineers designed a new and very different grinding machine to be used for the grinding of inner and outer ball bearing raceways. The machine was of a style never before seen in the grinding equipment industry and its smooth lines and streamlined appearance drew attention and favorable comment from all sides. It looked productive and easy to operate, while the Landis-Solex sizing device guaranteed automatic sizing of all races within its range.

Soon a ball bearing manufacturer who was interested in its possibilities installed several in his plant with the result that *production time was decreased 40%*, the grinding was more accurate and manufacturing costs dropped. The machine—the Landis No. 2 RACE-A-WAY Grinder—truly serves as a fine example of the efficiency and good qualities of modern Landis grinding machines.

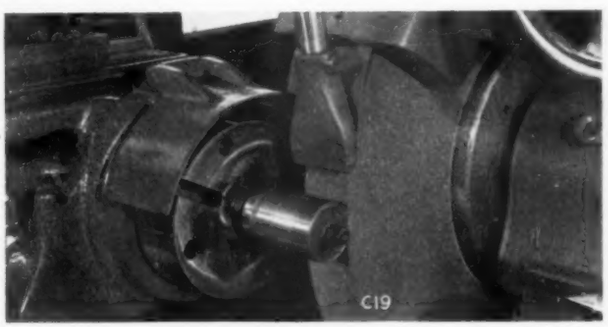


BEARING COMPANY KO'S OBSOLESCENCE

The illustration above shows what recently happened to Old Man Obsolescence in the plant of a connecting rod bearing manufacturer who believed that toll had been exacted entirely too long and too often.

The blow that finished him was the installation of a modern Landis 10" x 18" Type DC Plain Hydraulic Grinder in the plant. This machine immediately began to prove its value by turning out *3.2 pieces to every 1* previously obtained on older equipment. Such saving in time as this must mean a corresponding saving in money.

Many companies are paying tribute to this thief of time without realizing it. An investigation of production on older grinding equipment compared with that on the new and modern should reveal whether or not obsolescence is collecting toll in your plant.



COMPANY

WAYNESBORO PENNSYLVANIA.

"THIS MACHINE PERFORMS B

★

LIBBY Turret Lathes give complete satisfaction in performance—in accuracy—in ease of operation—in versatility—in economy—and in output. Find out how a LIBBY will fit into your operations to give you all of these benefits.

★

LIBBY Turret Lathes get the utmost out of the new high speed cutting tools, taking the heaviest cuts in the toughest materials worked in today's industrial plants.

★

Such a statement as that above is to be expected after the installation of a LIBBY. Our previous advertisements have shown examples of the time and money savings possible with a LIBBY—more examples will follow—You can equal and even exceed such results with a LIBBY in your production—so why not find out about a LIBBY—see how it can be applied to your needs and learn the numerous benefits that will be yours.

The Nashville Chattanooga and St. Louis R. R., Nashville, Tenn., has had a LIBBY in service for twenty-seven months. When the pictures shown were taken, main connection side rod bronze bushings were being machined to be used on locomotive side rods. The length of each bushing is five and fifteen-sixteenth inches and the diameter eleven and one-half inches —the depth of cut averages from one-quarter to three-eighths inches—the tolerances of each operation are: .030 outside diameter—.003 inside diameter—.063 length.

Here are the operations performed—face end, bore inside diameter to fit crank pin and cut off. This machine is used also for machining hub plates and general locomotive work.

FIFTEEN minutes is saved on the machining of each bushing. Formerly it required forty-five minutes—now, with a LIBBY the time is cut to THIRTY minutes.

A CLEARING PRODUCT

LIBBY

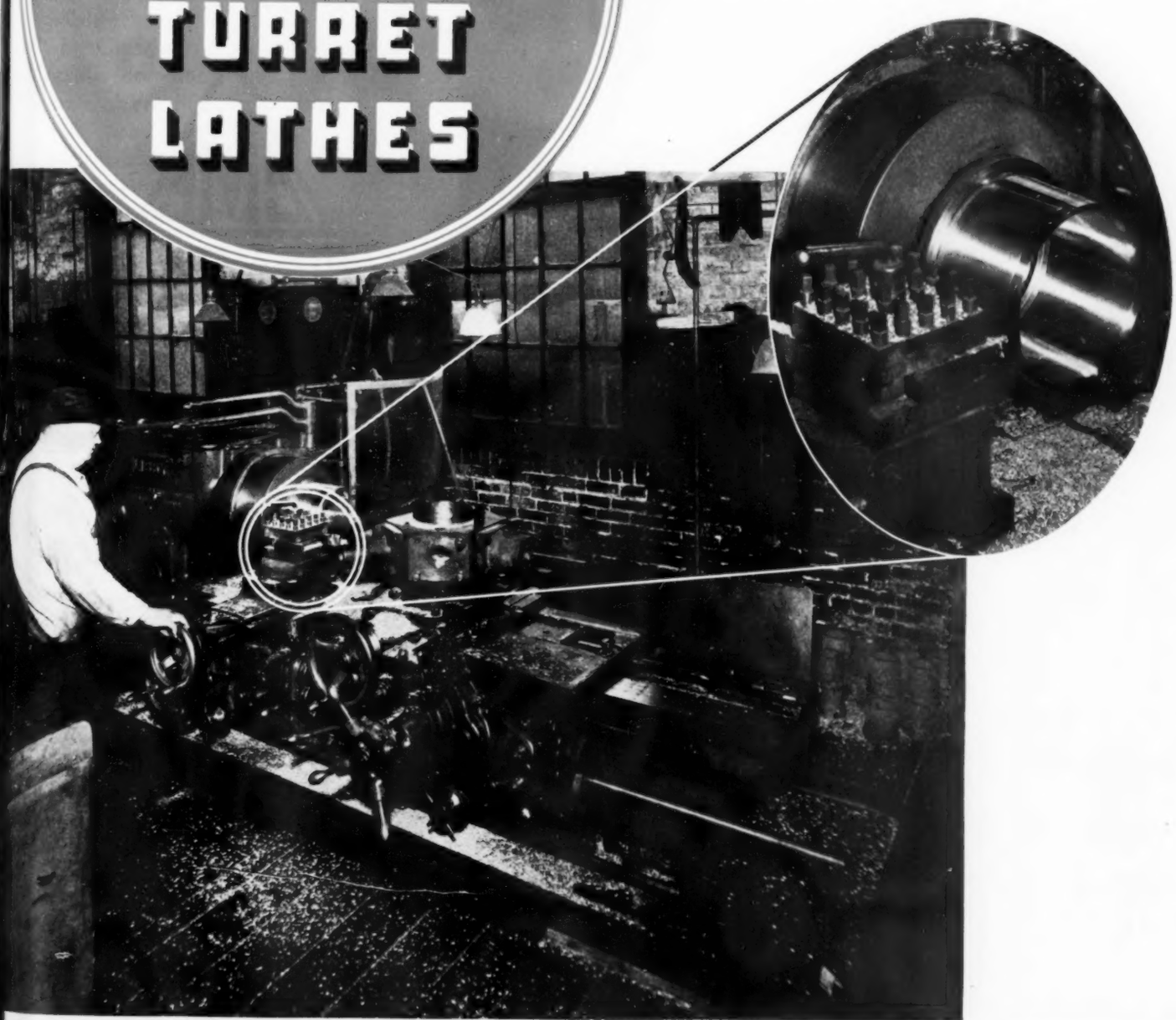
BUILT BY

S BEYOND OUR EXPECTATIONS"

NASHVILLE, CHATTANOOGA AND ST. LOUIS RAILROAD, NASHVILLE, TENN.

Libby TURRET LATHES

Our bulletins give the full story of LIBBY Lathes—tables are shown giving principal dimensions of all sizes—LIBBY sales engineers are available for conference at your convenience—write today!



INTERNATIONAL MACHINE TOOL COMPANY, INC.

INDIANAPOLIS, INDIANA

Division OF CLEARING MACHINE CORPORATION · · · CHICAGO, ILLINOIS

"save time . . d
do not have to
often . . .

WELBILT STOVE COMPANY, INC.
manufacturers of
GAS RANGES AND COOKERS

MEMBER A.G.A.

Equi-Thermal

Phones: HAvemeyer 8-1650-1-2-3
57-46 FLUSHING AVENUE
Maspeth, L. I., New York

December 15, 1939

CMC
CLEARING

Mr. R. W. Glasner, President
Clearing Machine Corp.
6499 W. 65th St.
Chicago, Ill.

Dear Sir:-

We wish to compliment you on the design and working performance of the two Clearing Presses which we recently purchased from you. We especially like the 12" adjustment which allows us to operate a die from 8" shut height to 20" shut height. This we find saves us considerable time in our Press Room as we do not have to move special bolster plates in and out. We have also noticed that since we have these presses that the dies last much longer and do not have to be ground as often. We feel that this is the only type of press to buy in the future for our production.

Thanking you, we remain

Very truly yours,

James Haley

Plant Superintendent
Welbilt Stove Company, Inc.

J.Haley:ve

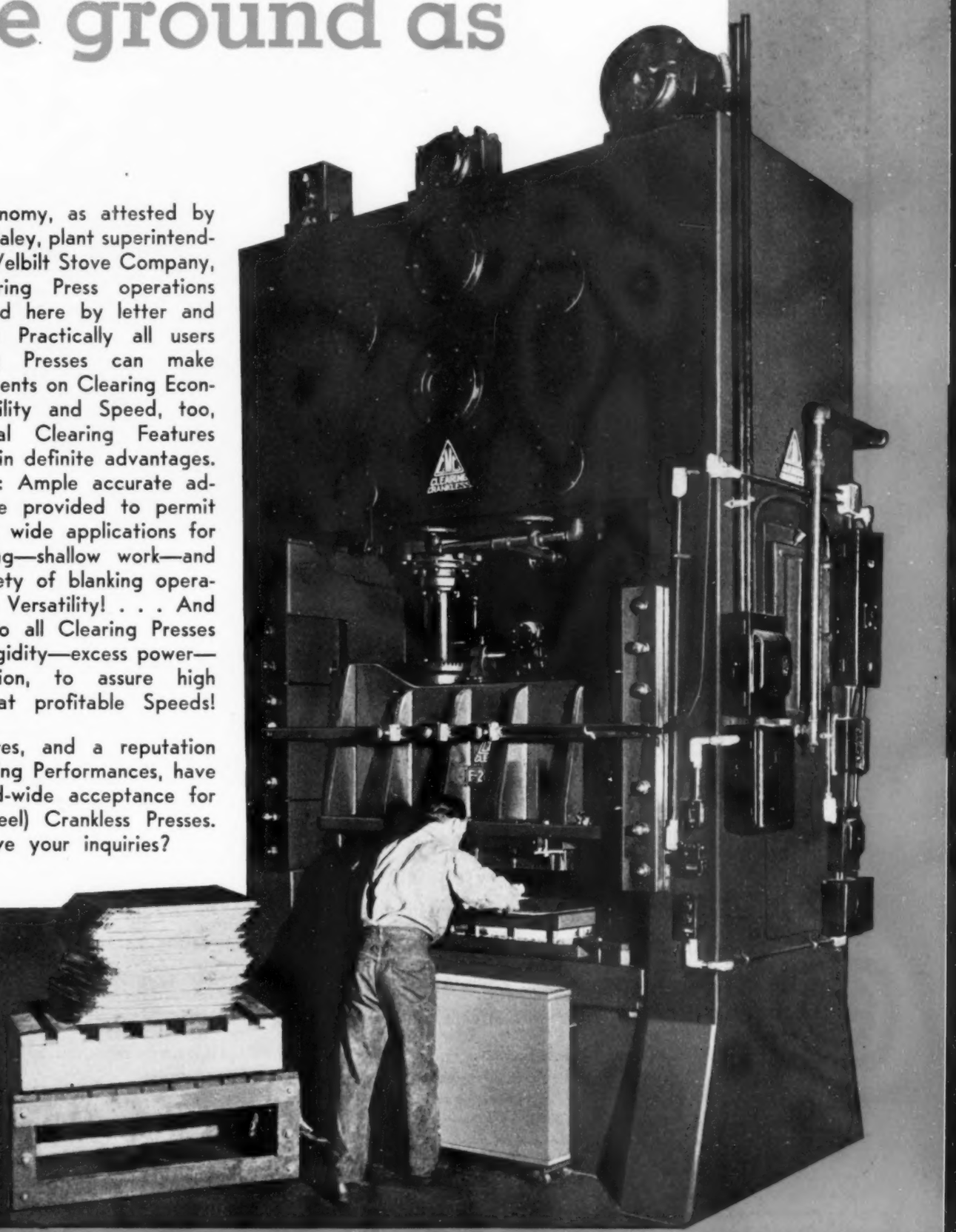
"World's Biggest Selling Popular Priced Ranges"

CLEARING MACHINE

. . dies last longer and
ve to be ground as
n . . .

—that's Economy, as attested by Mr. James Haley, plant superintendent of the Welbilt Stove Company, whose Clearing Press operations are illustrated here by letter and photographs! Practically all users of Clearing Presses can make similar comments on Clearing Economy. Versatility and Speed, too, are practical Clearing Features which result in definite advantages. For example: Ample accurate adjustments are provided to permit exceptionally wide applications for deep drawing—shallow work—and a large variety of blanking operations. That's Versatility! . . . And designed into all Clearing Presses are ample rigidity—excess power—ultra precision, to assure high production at profitable Speeds!

These features, and a reputation for outstanding Performances, have won a world-wide acceptance for Clearing (Steel) Crankless Presses. May we have your inquiries?



CORPORATION **CHICAGO and DETROIT**

Master Sculptor in Steel...

The traditions of Taft-Peirce have always attracted craftsmen of this stamp—toolmakers and machinists of proven skill. Their common bond is *inflexible pride.* Pride in the mastery of creative tools. Pride in the confidence reposed in them, that they will unfailingly produce masterpieces of precision. Pride in the fact that when their work is done, no other hand can refine it further.

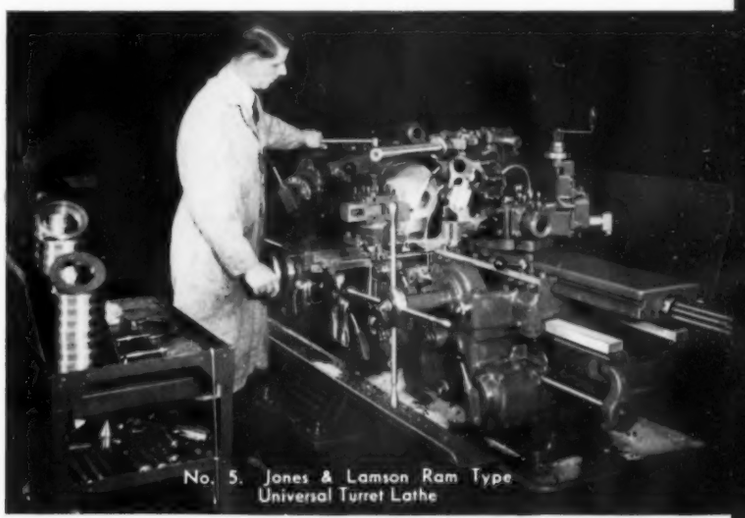
At Taft-Peirce, their experience is available to large and small manufacturers alike, at costs which are kept down by speed and unerring precision of work, and by a low overhead spread over many jobs. We shall be glad to show you just how effectively it can be applied to *your* problems. Write today to: THE TAFT-PEIRCE MFG. CO. WOONSOCKET, RHODE ISLAND

TAKE IT TO TAFT-PEIRCE

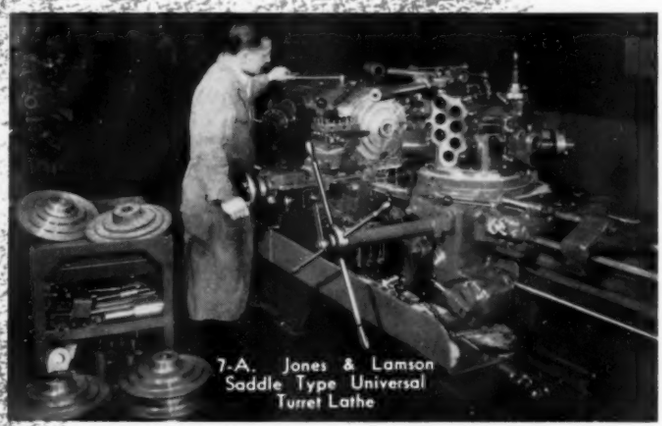
1935

PROFITABLE METAL WORKING EQUIPMENT
IN ITS *Second Century* OF
PROGRESS

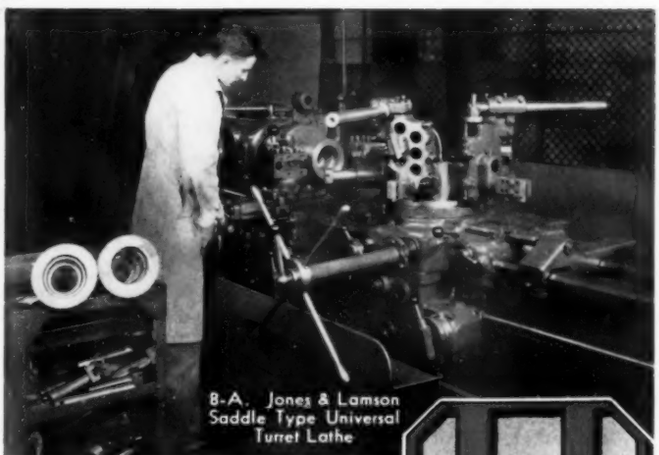
1940



No. 5. Jones & Lamson Ram Type Universal Turret Lathe



7-A. Jones & Lamson Saddle Type Universal Turret Lathe



8-A. Jones & Lamson Saddle Type Universal Turret Lathe

Jones & Lamson Turret Lathes were the first machines of their kind with an automatic indexing turret. Five years ago Jones & Lamson Machine Company entered its second century of service to the metal working industry.

Today Jones & Lamson is still designing and building the most advanced turret lathe equipment anywhere available. We'll prove it!

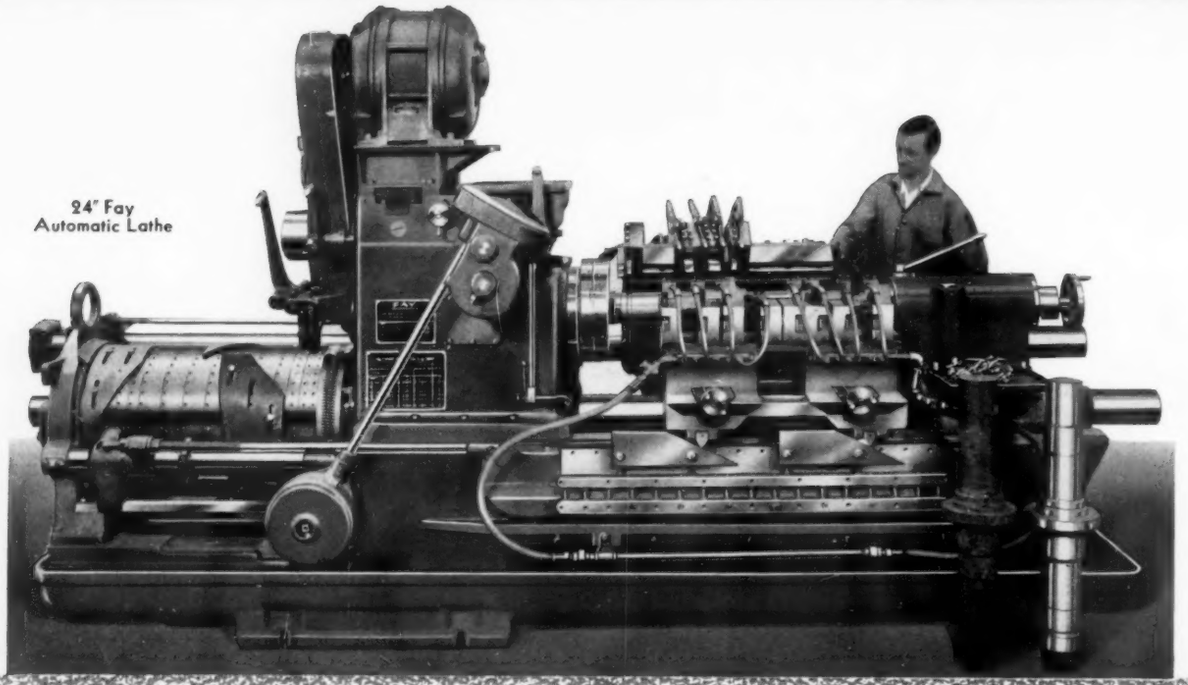
Modern Jones & Lamson Turret Lathes are designed for both today and tomorrow. They handle present hard alloy cutting tools to maximum capacity and are built to anticipate future cutting tool developments. Every piece of Jones & Lamson equipment embodies in its design features that provide ease of handling and ample reserves of speed, rigidity and transmission of power. You can select from the Jones & Lamson line the turret lathe which is best adapted to the specific kind of work you have to handle.

Jones & Lamson
TURRET LATHES

Write today to Jones & Lamson engineers to assist you in modernizing your production for profits.

JONES & LAMSON MACHINE CO.
Springfield, Vermont, U. S. A.

PROFIT PRODUCING MACHINE TOOLS



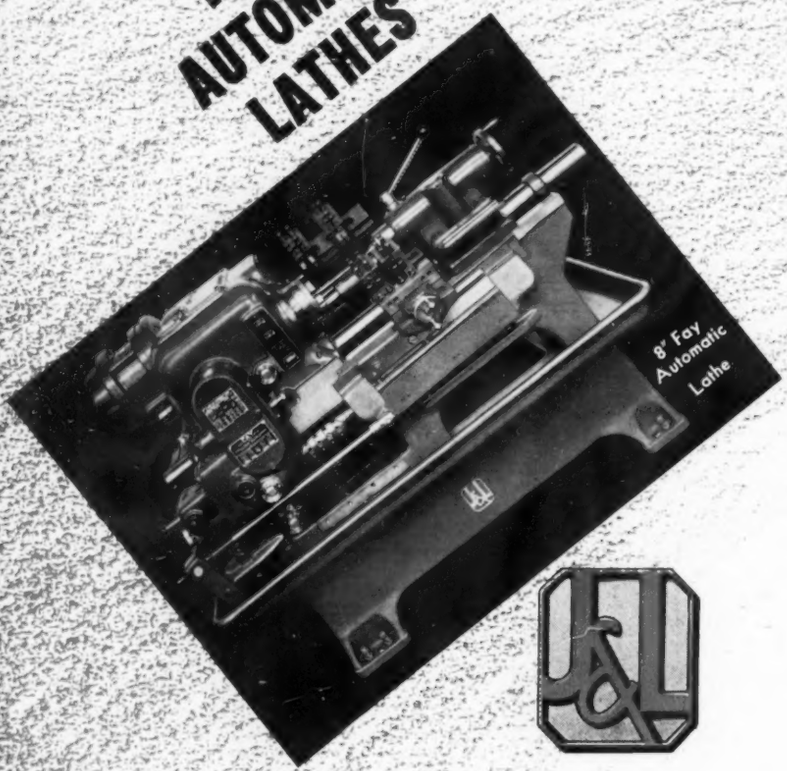
24" Fay
Automatic Lathe

JONES & LAMSON OFFERS THE *Profitable Way*

TO USE A STANDARD MACHINE

FOR *special work*

FAY AUTOMATIC LATHES



8" Fay
Automatic
Lathe

Whether you're running eight hours a day — or twenty-four; whether your lots are large or small, you are always faced with the question, "Must I buy a special machine for this job, or is there more versatile equipment which will serve me as well?"

So far as turning operations are concerned, the Fay Automatic Lathe combines a standard design with various standard attachments which make this modern machine universally adaptable.

The use of standard elements with a minimum of highly specialized equipment makes the Fay Automatic Lathe a practical, special purpose machine — accurate, durable and a cost-cutter on moderate size lots as well as on continuous production.

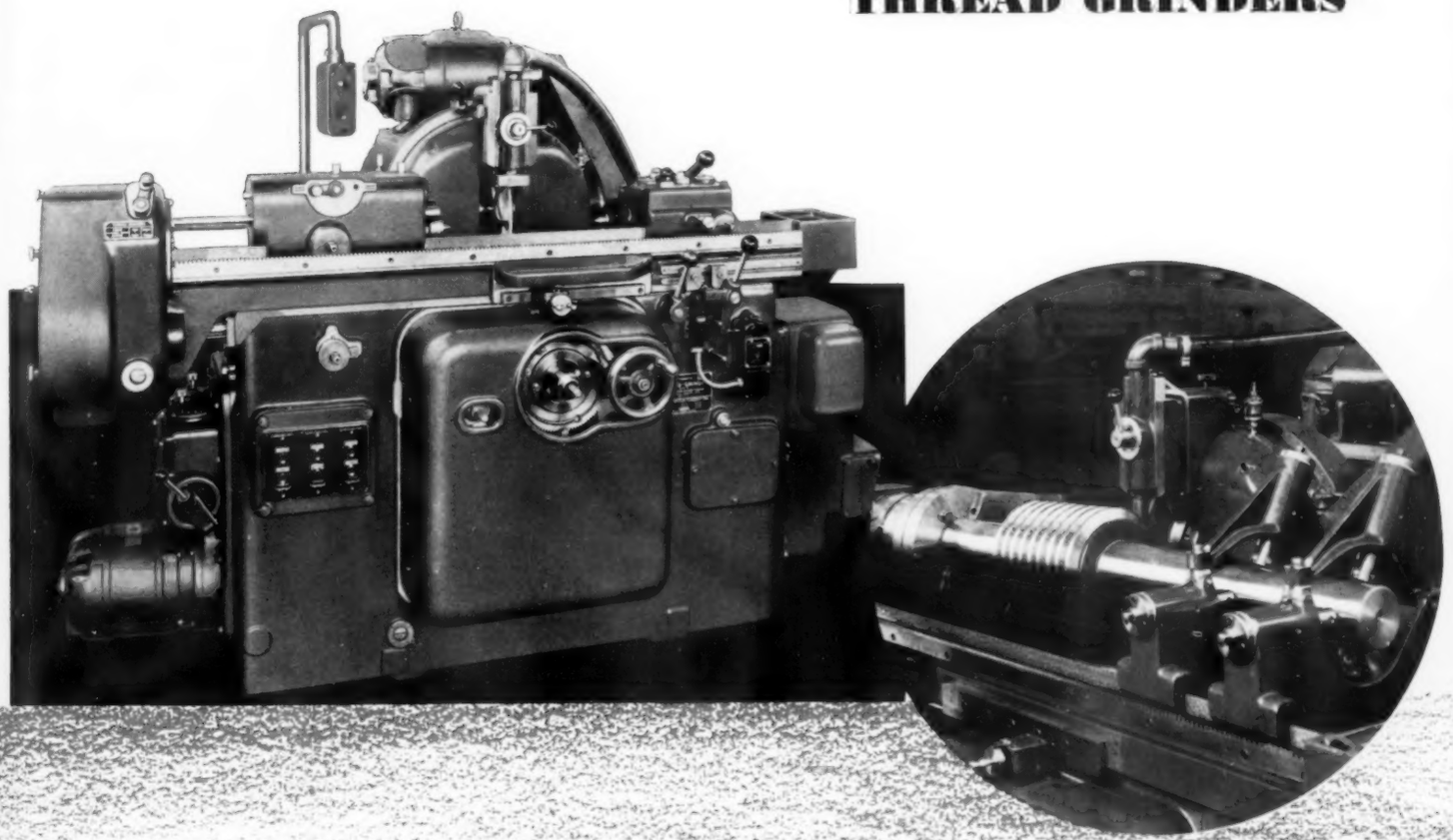
Jones & Lamson offers Fay Automatic Lathes in sizes to meet your requirements — for chucking work or work on centers — for simple or multiple tooling — rough work, finish work — or both in combination.

Ask Jones & Lamson engineers to show you how the Fay Automatic Lathe can help you simplify your production turning, facing, chamfering and grooving operations on large lots or small.

JONES & LAMSON MACHINE

PROFIT PRODUCING

MODERN *low-cost* THREAD PRODUCTION ON JONES & LAMSON AUTOMATIC THREAD GRINDERS



AUTOMATIC THREAD GRINDERS

Jones & Lamson gives you the benefit of more than twenty years of continuous experience in the thread grinding field. This experience resulted in a thread grinder, which not only cuts threads accurately, but which, in many instances cuts any thread at lower cost than they can be cut by any other means.

In operation, the Jones & Lamson Automatic Thread Grinder removes metal by a true cutting action at a high rate of removal without burning the work or sacrificing accuracy.

The Jones & Lamson Automatic Thread Grinder is fully automatic in operation. It will grind right- or left-hand threads from the solid or from previously roughed threads, and will handle threads up to 12" in diameter and 15" long. It is guaranteed to hold thread angle to + or − 5 minutes on the half angle and lead, + or − .0002 in. per in. Taper threads can be ground without compensation for lead.

Investigate the possibilities of this machine for tool room or production service. Full details available on request.

CO., Springfield, Vermont, U. S. A.

MACHINE TOOLS

MODERN MONEY SAVERS

for Inspection

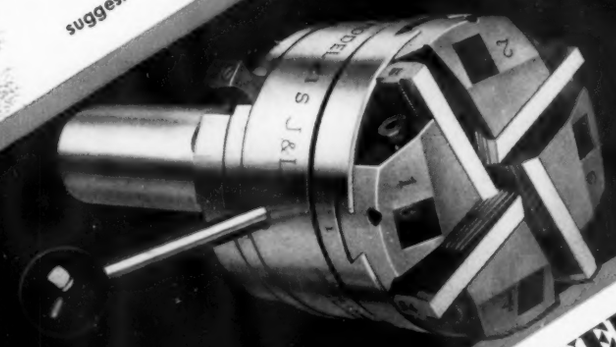
JONES & LAMSON
COMPARATORS

Jones & Lamson Comparators answer to the problem of handling your measuring operations including those which do not lend themselves to direct gaging. These instruments provide a means of optical inspection which is quick, accurate and widely adaptable. They are ideally suited to measuring angles, height or depth, lead or spacing, as well as contours on a wide variety of products, tools and gages.

Jones & Lamson Comparators are available in Pedestal, Bench and Hood Types. They meet all requirements of the tool room, production line and laboratory, and quickly repay their first cost in time savings and quality control.

Jones & Lamson engineers will be glad to submit constructive suggestions for modernizing your inspection system.

Pedestal Comparator and Measuring Machine



Jones & Lamson Tangent Die (Revolving Type)

Bench Comparator

Jones & Lamson Hartness Radial Die Head (Stationary Type)

JONES & LAMSON DIE HEADS, THE PRODUCT OF PIONEERS *in Better Threading Tools*

The first self-opening automatic die head was a Jones & Lamson product. Today all Jones & Lamson Dies are guaranteed to hold a Class 3 fit, and their accuracy insures faster production of acceptable threads at lower cost.

The Jones & Lamson Hartness Stationary Radial Die Head is designed for heavy duty threading, short runs and a quick change of jobs. It is supplied with chasers either ground or ground and lapped in the thread after hardening.

Jones & Lamson Tangent Dies are particularly adapted to long runs, are hardened and ground throughout, assure utmost precision and long life. With only one set of chaser holders for right-hand threads, and only one set of chaser holders for left-hand threads, any right-hand or left-hand thread within the die capacity, regardless of diameter or pitch, can be cut.

Take advantage of Jones & Lamson experience by writing today for assistance in modernizing your threading jobs.

JONES & LAMSON MACHINE CO.

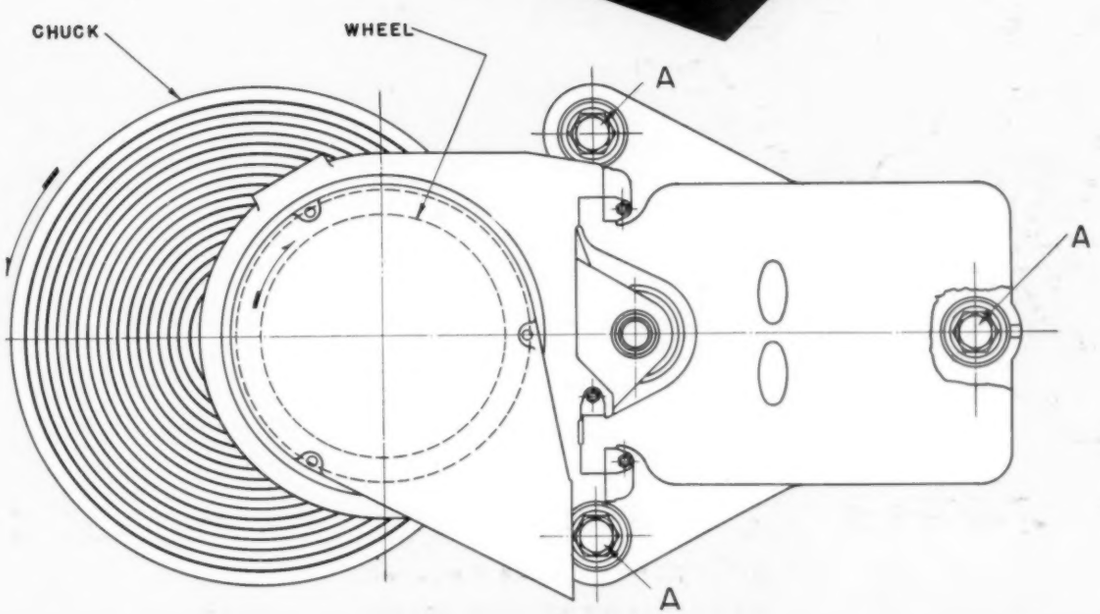
Springfield, Vermont, U. S. A.

PROFIT PRODUCING MACHINE TOOLS

It's the principle of the thing

Work carried on the Blanchard rotary magnetic chuck is ground with the end of a cylinder or segment wheel. A flat surface is generated on the work regardless of the shape of the wheel face. The two sets of curved grinding marks, crossing each other all over the surface, serve as a check on the flatness. There can be no low or high spots in such a surface. One test with a straightedge across the center will check the alignment of the machine. This correct parallel alignment of the axes of wheel and work is easily maintained with the Blanchard Three Point Column Support. This means of adjusting spindle alignment has been proved dependable by thirty years of use.

BLANCHARD

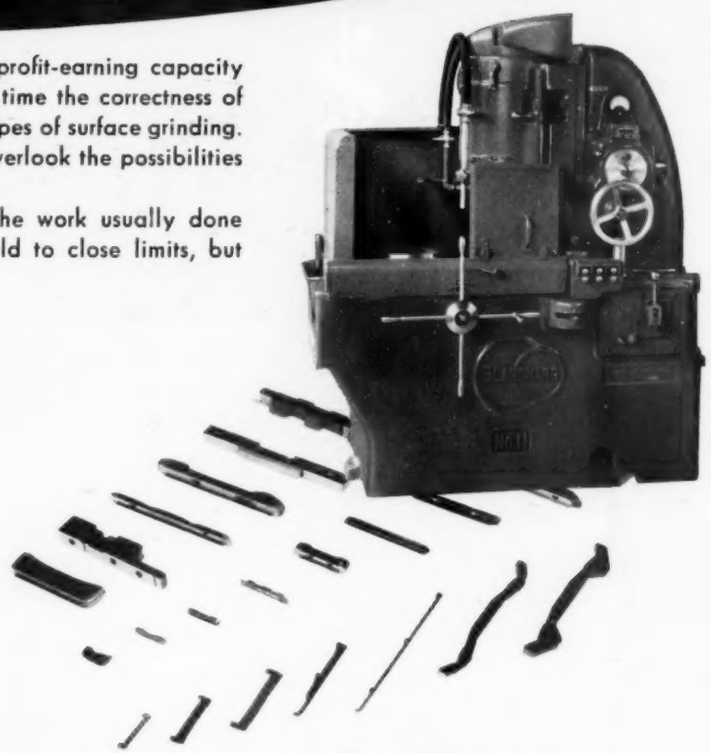


And this principle

BLANCHARD GRINDERS have been proved as to profit-earning capacity and accuracy over a period of thirty years. During this time the correctness of the Blanchard principle has been demonstrated on all types of surface grinding. Any shop that has flat surfaces to machine should not overlook the possibilities of these modern, proved machines.

Blanchard Surface Grinders not only grind rapidly the work usually done on a surface grinder, including finely finished work held to close limits, but they also rough and finish flat surfaces on castings and forgings in one operation.

Send for booklet, *Work Done on the Blanchard,* which shows over a hundred pictures of work with data, like the close-ups on these pages.



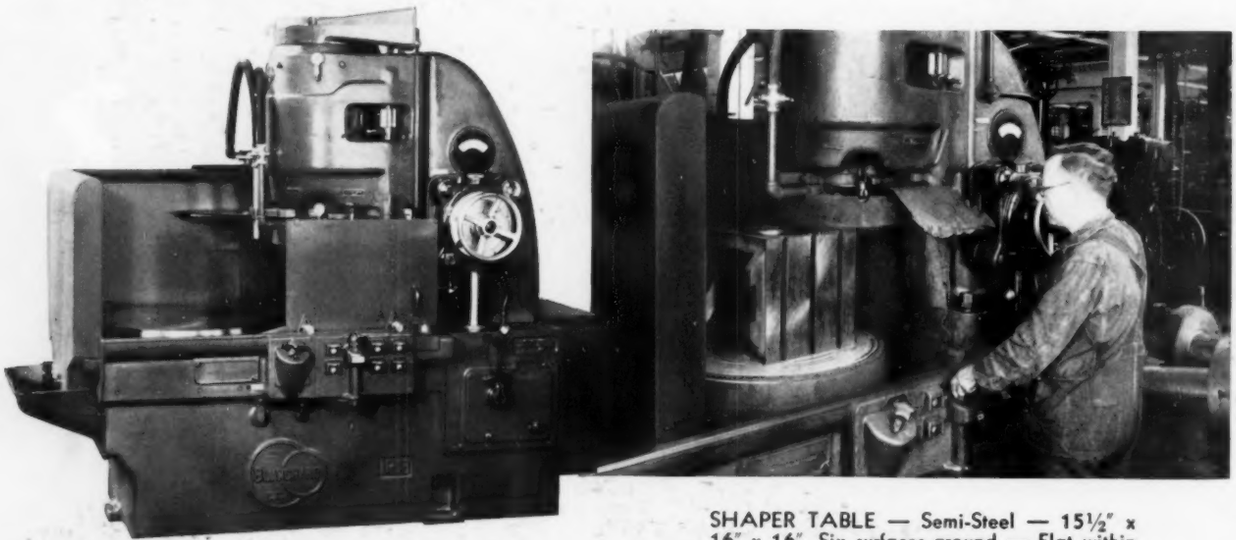
This group of parts is ground to limits of +.0000" and −.0005".

No. 11 BLANCHARD SURFACE GRINDER

This new small Blanchard has the power, the rigidity and the ease of control that have made the No. 18 Blanchard so successful. Fast, accurate, easy to operate, it has proved profitable for both tool work and small lot production.

No. 18 BLANCHARD SURFACE GRINDER

The No. 18 is used on a wide variety of production and tool work. Many features of proven value, such as direct motor drive, three-point column support, one-piece steel magnetic chuck and easy cleaning base, insure accuracy, greater speed and ease of operation.



SHAPER TABLE — Semi-Steel — 15½" x 16" x 16". Six surfaces ground — Flat within .0005" — Square within .0015" in 16 inches.

pays dividends

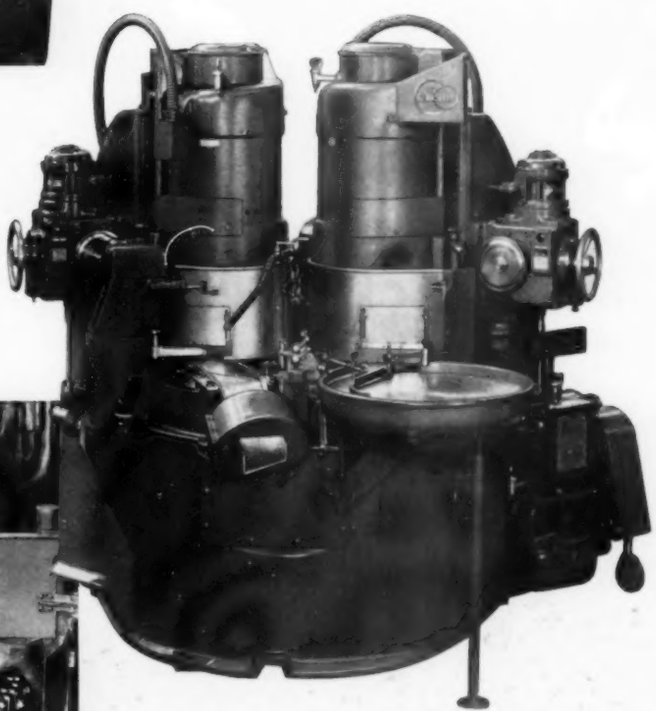
No. 16-A BLANCHARD AUTOMATIC SURFACE GRINDER

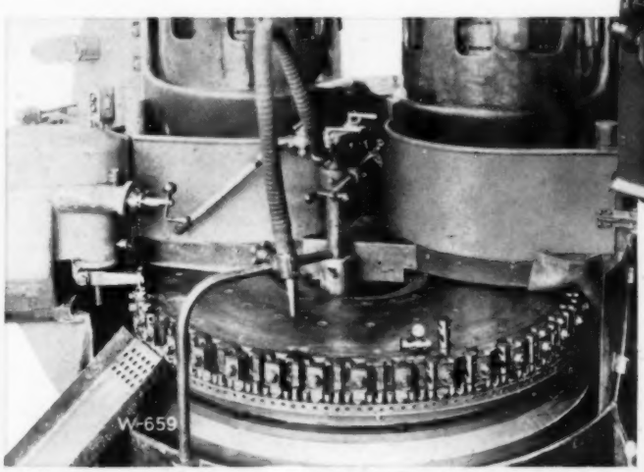
The No. 16-A Blanchard Automatic Grinder is used for quantity production of small parts. It grinds continuously with a wheel that is set and automatically maintained at a fixed height; one surface of the work is finished to size in one pass under the wheel.

Trunnion Bearing — Hardened Steel 15 16" diameter — Stock per side .006" — Production 2,000 per hour.

No. 16-A2 BLANCHARD AUTOMATIC SURFACE GRINDER

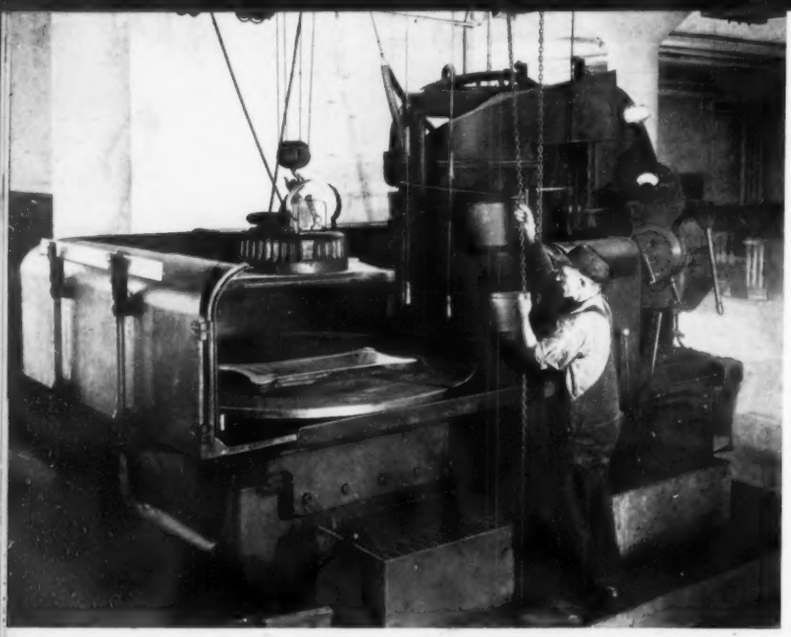
The No. 16-A2 has two wheels, each with automatic size control, and roughs and finishes one surface of the work in one pass through the machine. Because each wheel can be selected for its part of the grinding operation, without having to compromise between roughing and finishing, the No. 16-A2 is particularly suited to work requiring fine finish and close limits.





VALVE TAPPETS — Chilled Cast Iron — Stock per side 1/32" — Limits .001" — Square within .001" across diameter — One side ground — Production 2,600 pieces per hour.

BLANCHARD



No. 27
BLANCHARD SURFACE GRINDER

The No. 27 is the largest Blanchard Grinder, made with various sizes of wheel up to 42″ diameter, and with capacity for work up to 96″ diameter. It is used for die blocks, die bases, sharpening blanking dies, elevator base plates, rotary shear knives, packing rings, steel mold plates, etc.

BLANCHARD GRINDING WHEELS

We manufacture grinding wheels for use on all Blanchard Grinders. The wheel used on our grinders may be a plain cylinder wheel, a Blanchard sectored wheel, or a segment wheel. As builders of the machines we know their wheel requirements, and are also able to constantly test our wheels in operation in our own shop. We specialize on Blanchard Wheels and spare no trouble or expense to produce the freest cutting and most uniform wheels possible. All our wheels are selected for grade, by mechanical means, after manufacture.

High Power Type

Adjustable Gap Type

BLANCHARD DEMAGNETIZERS

Blanchard Demagnetizers are made in two types. The High Power Demagnetizer is designed for use on Blanchard Automatic Grinders, although it can also be used separately for small work.

The Adjustable Gap Type is a new and very powerful unit designed for bench use only. It handles a wide range of sizes of work and has sufficient power to quickly demagnetize heavy pieces or a quantity of small pieces held in a wire basket. The work is placed in the gap and slowly withdrawn.

Literature on any products shown will be sent on request.

THE BLANCHARD MACHINE CO.

64 STATE STREET CAMBRIDGE, MASS.

Bryant goes the whole way in profitable hole grinding

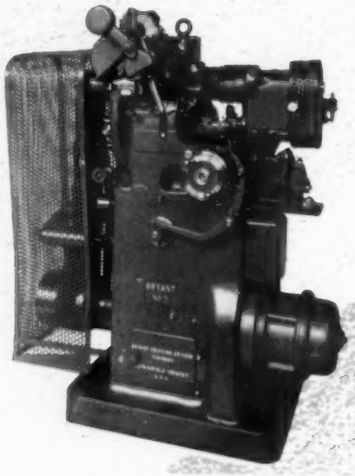
The versatility of the Bryant line of internal grinders pays real dividends in the job shop or in the production line. Not only will these machines grind the variety of work shown above, but they will grind any of these forms in combination. If you are interested in additional profits on your internal and face grinding jobs, send blueprints or samples to Bryant for complete information.

BRYANT CHUCKING GRINDER CO., Springfield, Vt.

Bryant goes the whole way in profitable hole grinding

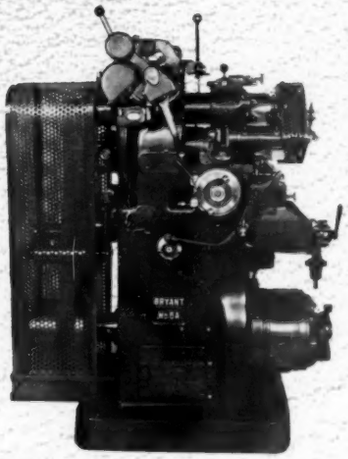
THE No. 4 BRYANT GRINDER

This machine is equipped with an automatic sizing device, and is adapted to the grinding of blind, taper and straight holes. It is recommended for high production work, and will grind taper holes having a maximum included angle of 30 degrees. Capacity is 3 inches hole size, 2 inches long. Maximum diameter swing is 6½ inches.



THE No. 5 BRYANT GRINDER

Designed especially for small diameter bores in work such as: bearing rings, bushings, gears, etc. Outstanding features of the machine are simplicity and ease of operation. All movements of the wheel slide are controlled by one lever operated by the left hand, leaving the right hand free for handling the work. Maximum hole diameter is 3 inches, and 2¾ inches length. Maximum swing is 6½ inches.



THE No. 5-A BRYANT GRINDER

The only difference between the No. 5-A and the No. 5 is the addition of another wheel spindle on the wheel slide, which permits the grinding of bores and faces at the same chucking of the work. This machine has the same capacity as the No. 5.

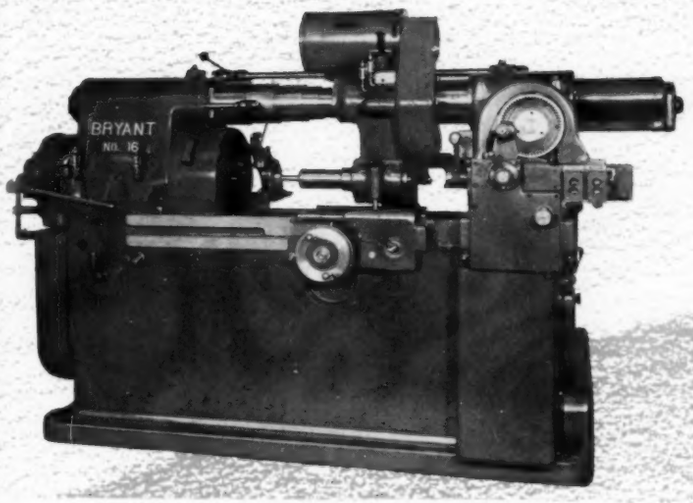
THE No. 5-B BRYANT GRINDER

The No. 5-B is intended primarily for grinding taper holes in small work having an included angle greater than 30 degrees. For steep tapers it is more convenient to have an angular adjustment for the work head. The maximum angular adjustment of the work head is 45 degrees, which permits grinding included angles up to 90 degrees. Maximum capacity is 4 inches diameter for taper holes and 3 inches for straight holes.

BRYANT

REG. U.S. PAT. OFF.

BRYANT CHUCKING



THE No. 16 SERIES BRYANT GRINDER

The No. 16 Series Bryant Grinders for medium size work have the following maximum capacities: The No. 16-16″ swing and No. 16-22″ swing; the No. 16-28″ swing; and the No. 16-38″ swing.

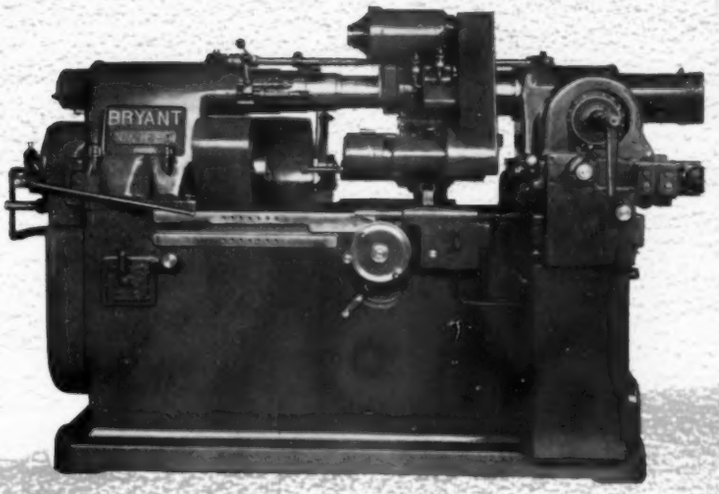
The No. 16 Series Bryant Grinders are hydraulically operated, and are controlled by a single lever conveniently located at the front of the machine. This single lever controls all functions of the machine including the cross feed, starting and stopping of the work, and all movements of the wheel slide.

THE No. 112 BRYANT GRINDER
12″ SWING AND 12″ STROKE

The new Bryant No. 112 with under-head slide bar retains every familiar fundamental advantage of Bryant construction.

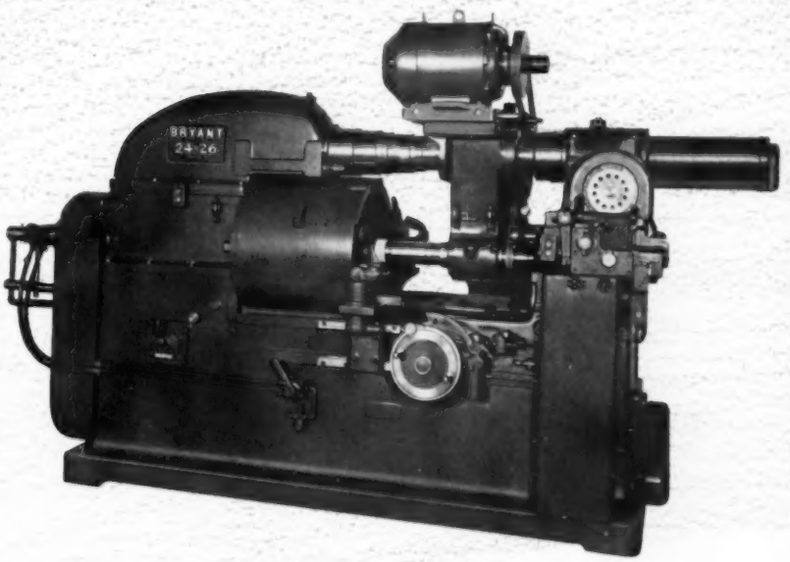
By locating the slide bar underneath the head, this new Bryant 12″ Model is cleared overhead, a feature which is considered desirable on certain types of work.

This Bryant Grinder has been developed to provide a general purpose hole grinder incorporating features which result in quick setups, convenient operation, high production, quality finish and accuracy.



BRYANT No. 16A-16
HOLE AND FACE GRINDER

The Bryant No. 16A-16 Grinder is a two-spindle hole and face grinder. This double-purpose machine has the advantage of grinding two or more different surfaces at a single chucking of the work, guaranteeing a high degree of accuracy, as the surfaces so finished are true and concentric with each other. The second wheel spindle offers the opportunity of grinding a face square with the ground hole and saves the time of rehandling.



THE No. 24 SERIES BRYANT GRINDER

If you are looking for an internal grinder, with unusual swing, with unusual accuracy and high production, it will pay to investigate the Bryant No. 24.

This heavy-duty machine is designed for grinding large diameters and long bores, such as airplane engine cylinders, etc. It is hydraulically operated and controlled by a single lever which governs all functions of the machine.

CAPACITIES, Inches

Swing	26	26	36	36
Grinding Stroke	16	24	16	24

THERE is a Bryant Chucking Grinder for every class of internal grinding work — for tool room or small lots as well as for production.

All these machines have the advantages offered by the Bryant Slide Control. This feature enables the operator to grind straight, and taper, a combination of straight and taper, or double taper holes in one operation as well as curved, cam shaped or blind holes. Two-spindle Bryant Grinders will grind the bore and face concentric in one setting of the work. From small bearings to large gears and cylinders, Bryant Grinders cover the complete range of internal and face grinding.

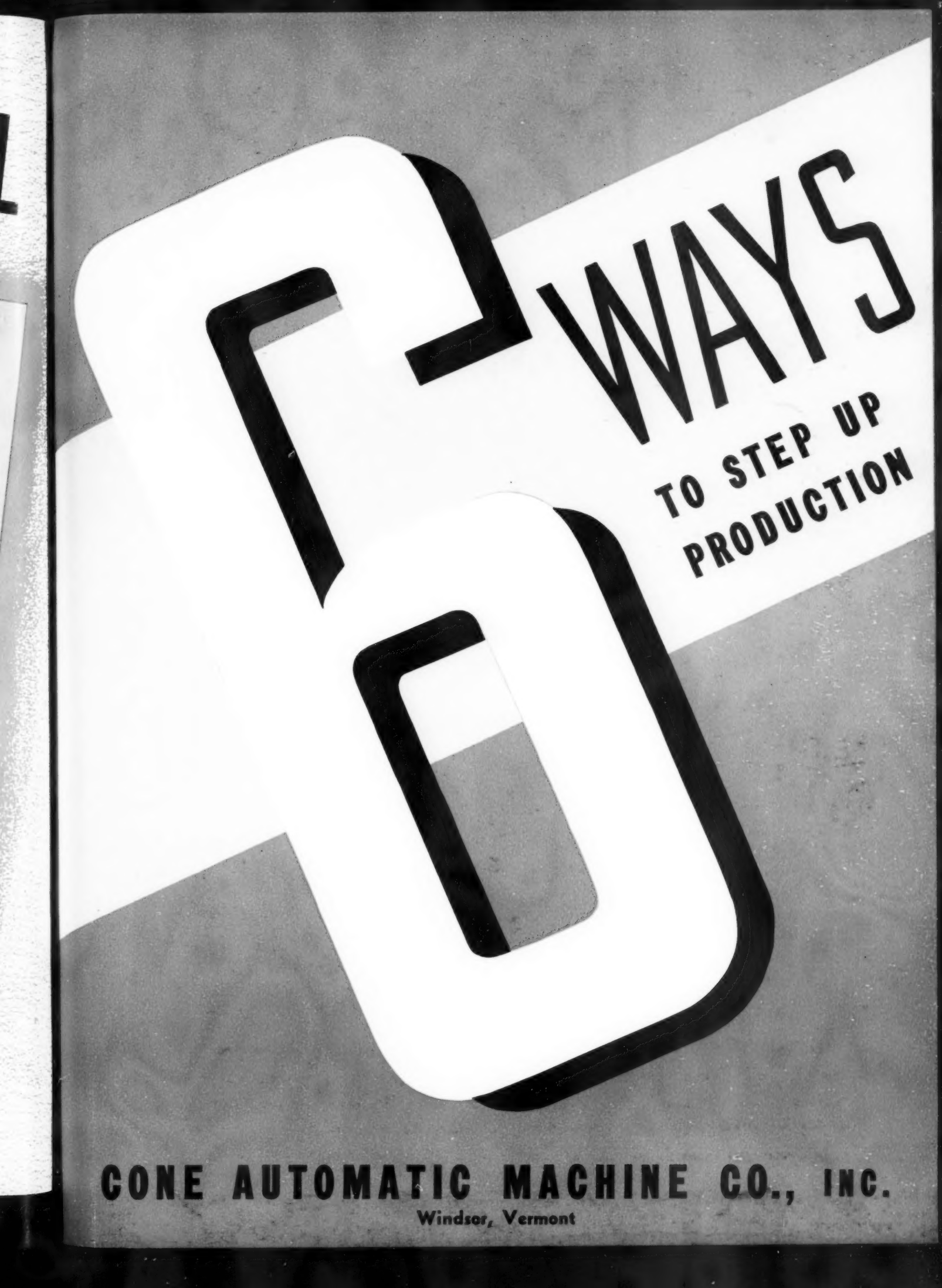
GRINDER CO. Springfield, Vt.

VERY LARGE OR VERY SMALL

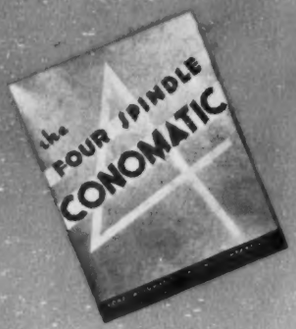
GRIND THEM ON A BRYANT

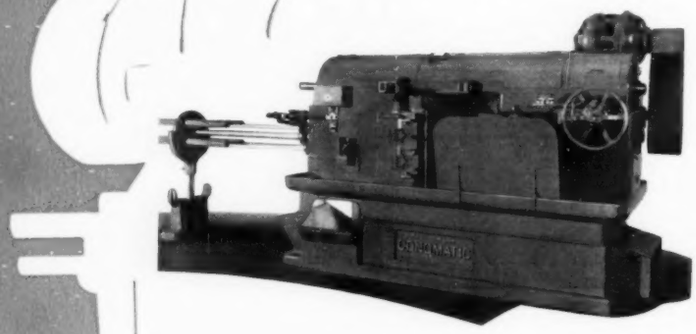
THE BRYANT LINE of Internal Grinders is suitable for grinding each size bore that may be required by the manufacturer's design. Any of these machines will produce finish and accuracy to satisfy every need. Straight and taper holes may be ground with standard equipment either separately or in combination with each other. Standard machines may be easily arranged to grind cams and out-of-round holes by adding the cam attachment.

BRYANT CHUCKING GRINDER CO., Springfield, Vt.


WAYS
TO STEP UP
PRODUCTION
CONE AUTOMATIC MACHINE CO., INC.
Windsor, Vermont

6 WAYS TO STEP UP PRODUCTION





1 4-SPINDLE CONOMATICS

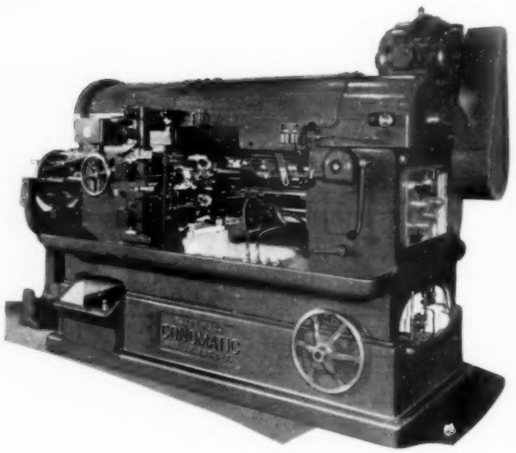
Modern in facilities for quick tooling and camming setup, these machines handle a wide range of bar stock work in multiple operations with precision and high productivity at low cost per piece.

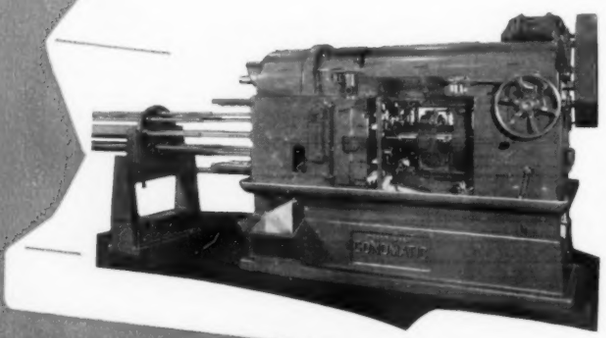
Made in 7 sizes — from 7/8" to 3 1/2".

2 6-SPINDLE CONOMATICS

Economy, high production, efficiency and flexibility are attained in these modern machines which feature independent acting, forming slides.

The 6-spindle Conomatic is built in six sizes — 1 1/4", 1 1/2", 1 7/8", 2 1/4", 2 5/8" and 3 1/2"-built with two slides, front and back. Forming slides on all machines allow independent actions.





3 8-SPINDLE CONOMATICS

Outstanding in rigidity, accuracy, finish and high production, 8-spindle Conomatics are demonstrating their high cost-cutting ability on many prominent production lines.

Modern features include: easily accessible operating cams; adaptability to a wide variety of tool setups; main members carry power feed, spindle carrier, turret slide, cross slides and top bed supported on heavy base; a construction that assures accuracy on heavy cuts and fine finish.

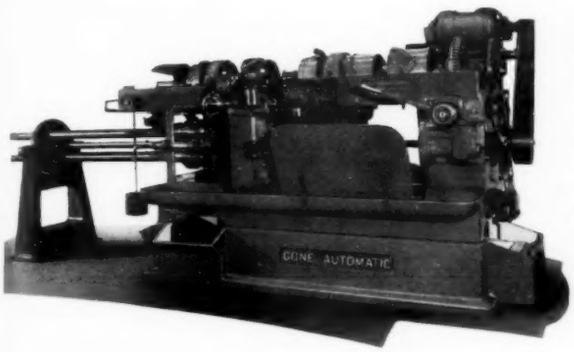
Made in five sizes — from 1 1/4" to 2 5/8".

When savings can be made which insure high net returns from an investment in modern equipment, it's just sound business to make the investment.

An important part of Cone Service is to give you an accurate estimate of the cost of handling your work on Cone Automatics; to give you a conservative and safe basis on which to make comparisons with your present costs; to enable you to judge for yourself the values and benefits you can derive from Cone Automatics on your production line.

Send specifications of the parts you make and Cone engineers will tell you how much you can save.

WITH CONE Automatics



4 4-SPINDLE AUTOMATICS

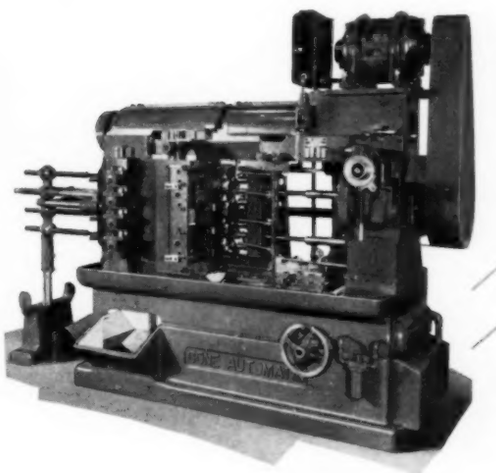
Larger in capacity but suitable for the same class of work as Cone 4-spindle Conomatics, these modern automatics have the stamina for heavy work coupled with accuracy in high production. Accessible tooling and camming speed setup.

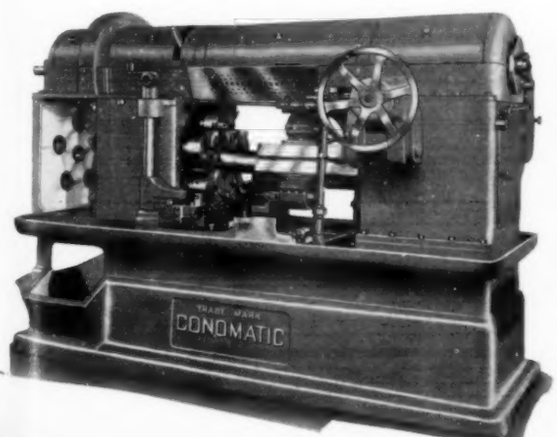
Made in 3½", 4⅜" and 6" sizes.

5 VERTICAL 4-SPINDLE AUTOMATICS

Of typical Cone design and construction throughout, this machine lends itself to the manufacture of a wide variety of products on a high production basis. It is highly efficient in cutting-off operations and can be arranged for light forming, chamfering and drilling.

Built in four sizes — from 1" to 2⅝".



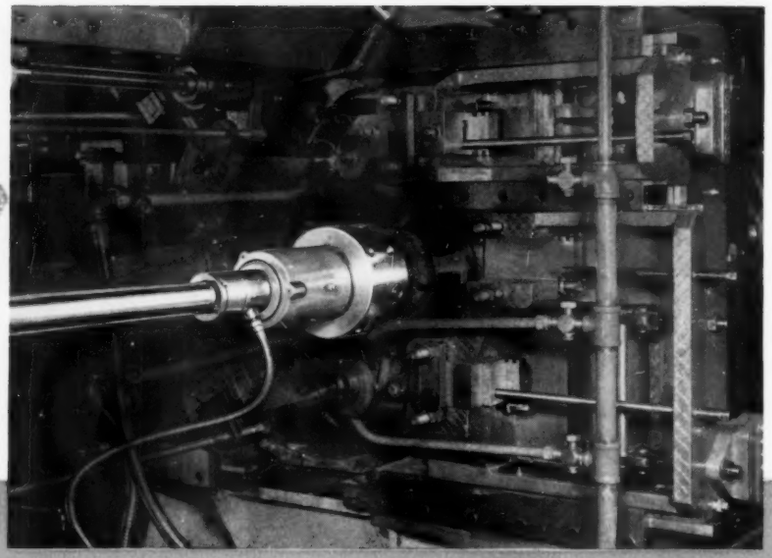


6 5-SPINDLE AUTOMATIC CHUCKING MACHINE

This modern machine is of the single belt drive type and can be driven either by motor or from countershaft. It is particularly adapted to machining forgings and similar work. Tool slide is a five-sided turret for drilling, turning, etc., in all stations. Cross slides have independent feeds and are adjustable for both straight and angular forming or facing. Auxiliary spindles may be mounted for independent end-working tools for drilling, reaming, threading, etc.

CONE AUTOMATIC MACHINE CO.
Inc.
Windsor, VERMONT

. . . and step up production even further with this remarkable Cone Attachment



A SCREW MACHINE ATTACHMENT FOR CROSS-MILLING, CROSS-DRILLING OR STAMPING **WITHOUT STOPPING THE SPINDLE!**

This Cone engineering achievement opens an entirely new field of profit possibilities — it eliminates other machines and other operations, saves floor space, reduces labor costs, and simplifies many designing problems.

This standard attachment permits taking cross-milling cuts no matter what the speed of the spindle; not only may cross-drilling be accomplished, but the holes may be drilled at any predetermined point on the length and circumference of the work; marking may be die stamped on the end of the work without stopping the spindle.

Let us estimate the savings on similar jobs for you — this new attachment may save thousands of dollars on a single job. Write Cone today.

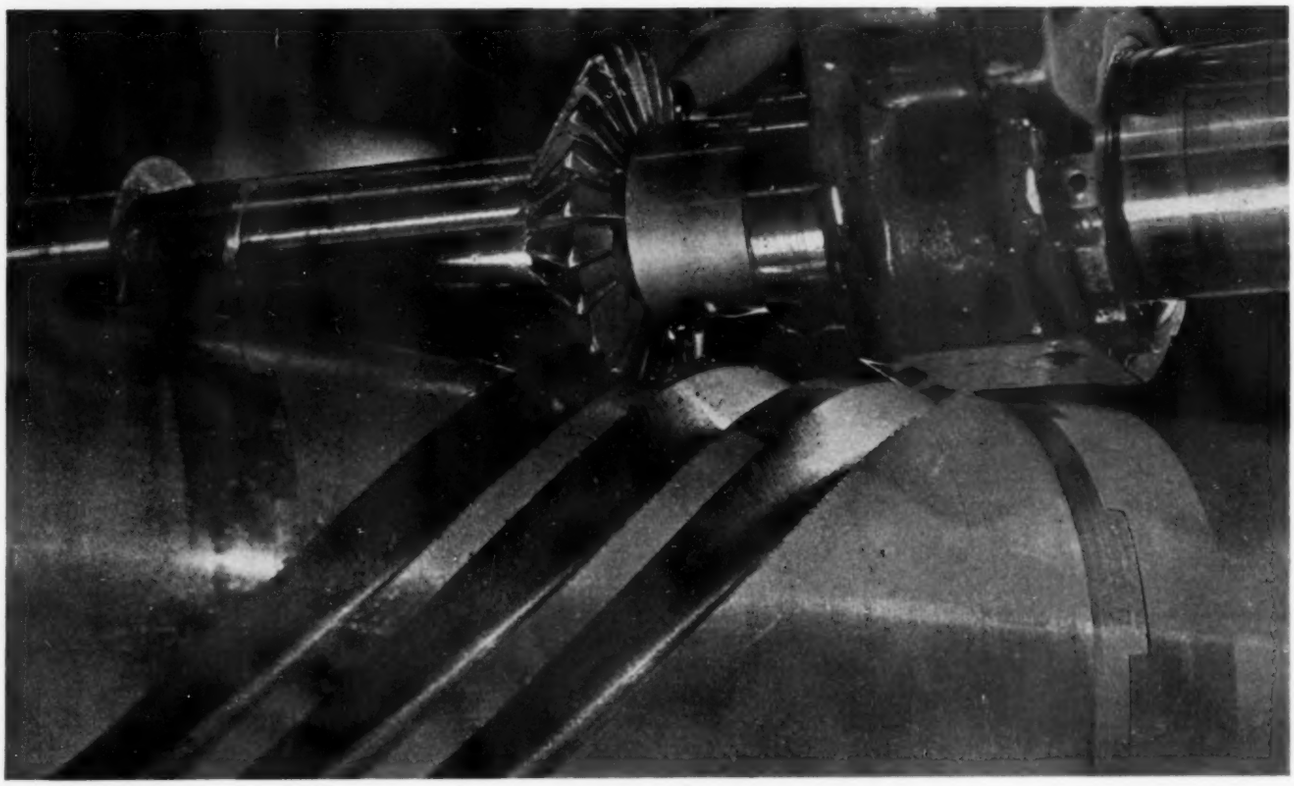
Milling

Cross Drilling

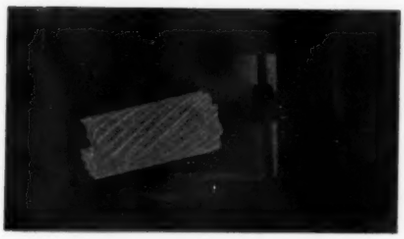
Stamping

CONE AUTOMATIC MACHINE CO., INC.

Windsor, Vermont



ACCURACY . . .



cuts cutter costs

Here is the same large cutter coming out of a furnace during heat treatment. Metallurgy is a controlled science at Pratt & Whitney. Every step is laboratory directed and electrically controlled. That is why our tools are *uniformly* good.

THE big cutter being milled in the photo above is a Pratt & Whitney cutter. The little one doing the milling is a Pratt & Whitney cutter. We *have* to use accurate tools. We insist on top performance . . . maximum cuts per grind . . . accurate profiles . . . hard, tough alloy steels. We know as well as you do that only good cutters give satisfactory results. *So we use our own* . . . the same in every way as those we sell to industry. Precision methods have reduced *our* costs . . . these methods have made it possible for *you* to buy better cutters for less.

You can get Pratt & Whitney milling cutters in all kinds and sizes. Tell us your needs and let Pratt & Whitney accuracy cut your cutter costs.

PRATT & WHITNEY

Division **Niles-Bement-Pond Company · West Hartford, Connecticut, U. S. A.**

THREE MORE ON THE WAY TO AMERICAN *Front Line* PRODUCTION » » »

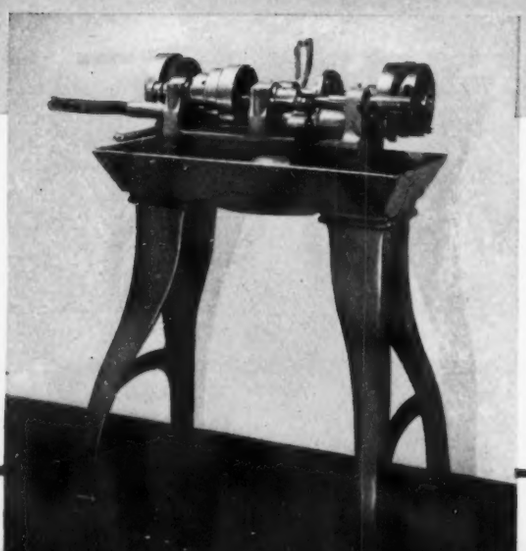
● Rapidly now—day after day—the new Cleveland Single Spindle Automatic, Model AA passes the final, last-minute inspection and leaves for the front lines of American production industries. An automotive plant, an arsenal, a tap and die manufacturer, a machine tool builder—all these and more require the amazing efficiency of this streamlined Cleveland Automatic, 1940 edition.

Yesterday on the drafting boards—*today* in the "hot spots" of American industry, this marvel of engineering efficiency and ingenuity, produced by the pioneer builders of the automatic screw machine, is setting new standards of production everywhere.

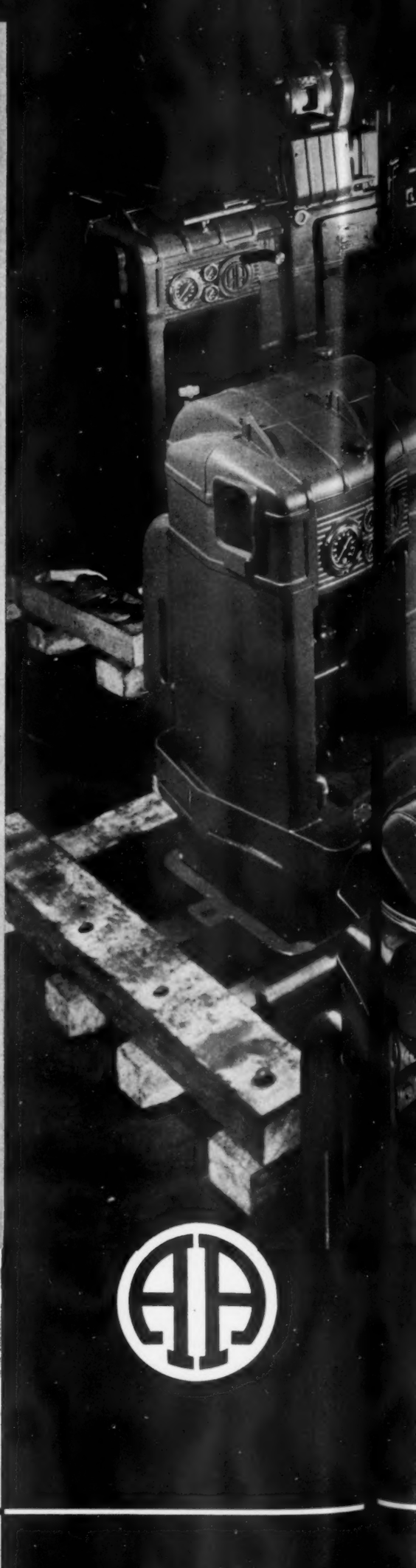
Speed enough for non-ferrous metals? And some to spare! Flexibility? Wrapped up in a dynamic package of power-plus versatility, Model AA Cleveland Automatics leave former production records far behind. Revolutionary? To be sure, for the Model AA Attachment Drive puts within reach of any owner the utmost range in applications without obsoleting any tools on hand. The new Cleveland Single Spindle Automatic, Model AA can be arranged for either Draw-in, Push-out or Sleeve Type Collets.

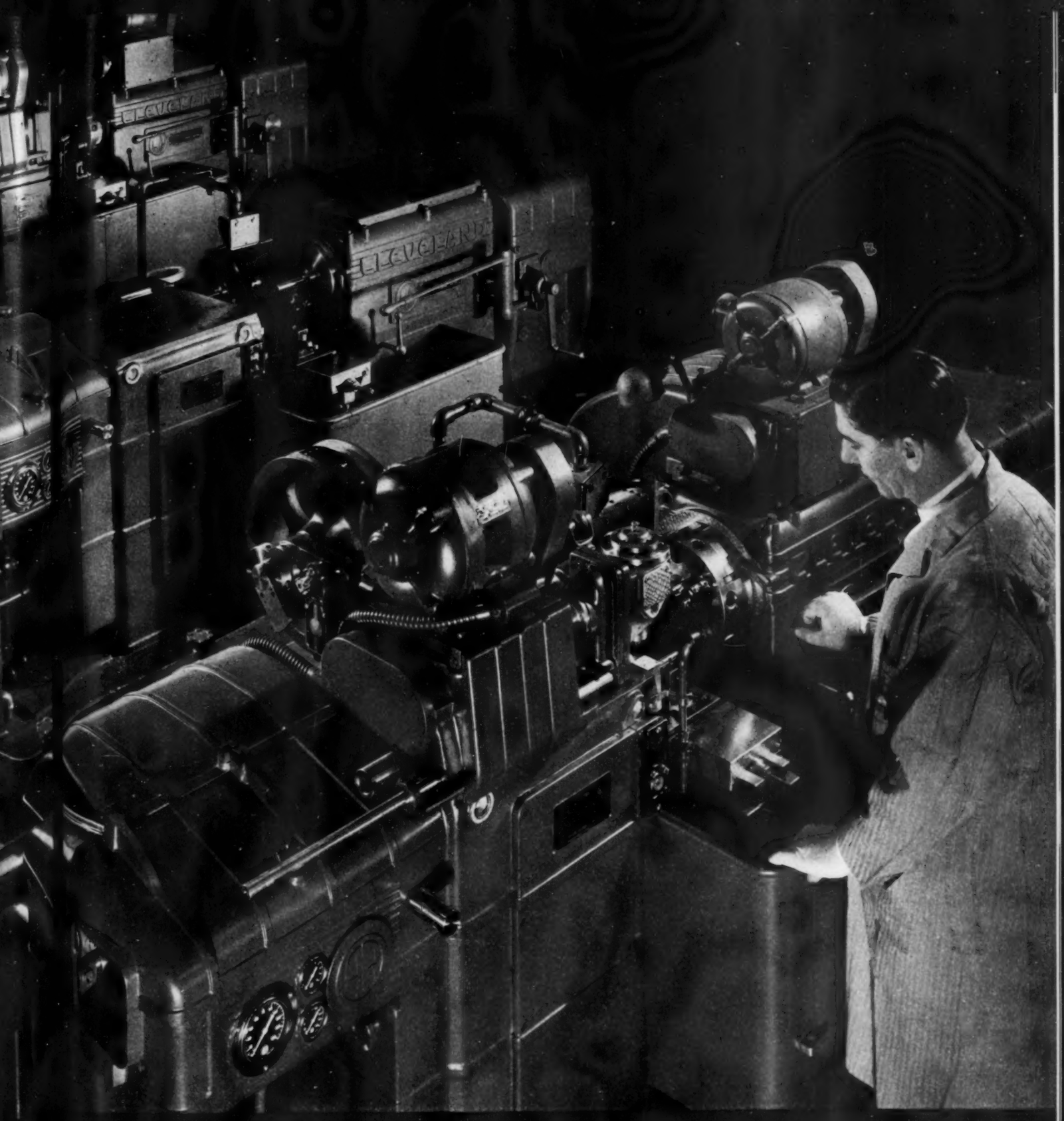
Ask for booklet describing this surprising addition to America's production efficiency—the machine it was said *could not be built to run.* It's running—in many plants today—running away from anything you ever saw in production capacity and smoothness of operation.

THE CLEVELAND AUTOMATIC MACHINE COMPANY
2269 ASHLAND ROAD • CLEVELAND, OHIO
Sales Offices: NEW YORK—50 Church St. • DETROIT—2842 Grand Blvd.
CHICAGO—565 West Washington St.



"... Model AA is as much a pioneer as its very first predecessor, shown here, the first Cleveland Automatic ever built, in 1888."



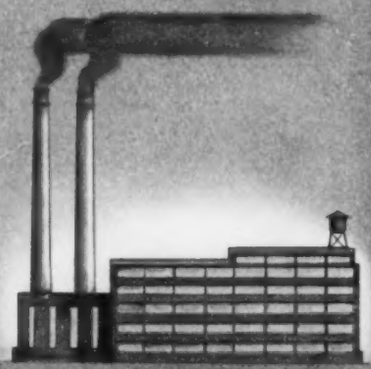


CLEVELAND

MODEL AA *Single Spindle* AUTOMATIC

FEDERAL

BEARINGS



THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

Detroit Sales Office: 2608 Book Tower • Chicago Sales Office: 902 S. Wabash Ave.
Cleveland Sales Office: 402 Swetland Building

Throughout Industry...

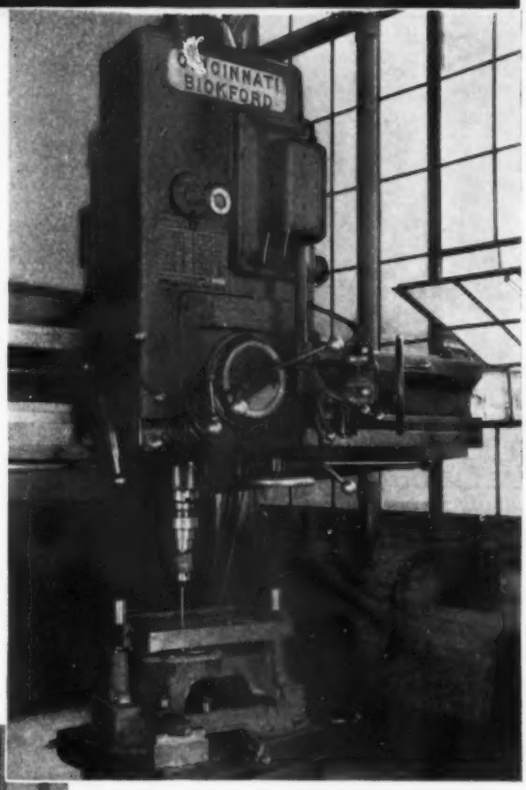
THIS SUPER SERVICE TRADEMARK MEANS "MORE HOLES PER DOLLAR"!

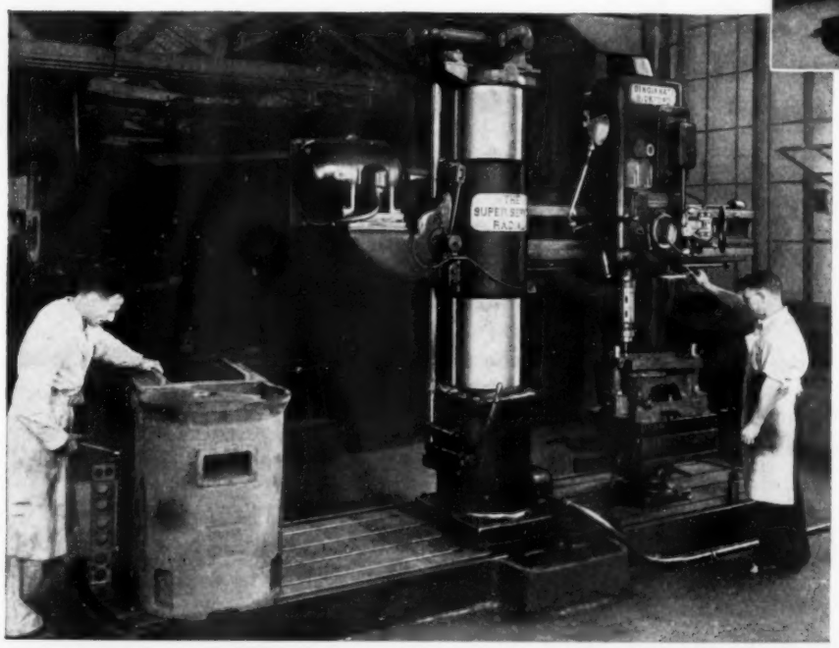
This is the modern way to

DO TWO THINGS AT ONCE, SAVING 4½ HOURS DAILY,

on a special double extended base Cincinnati Bickford Super Service Radial Drill at the Cross Gear & Machine Company.

● "Two jobs of quite different size and types are facilitated due to the unusual flexibility of this machine," says an executive of the Cross Gear & Machine Company. He further states, "We like the Cincinnati Bickford Super Service Radial Drill for the many exclusive features such as low controls all centralized on the head, simple but effective rapid traverse mechanism for the head, directional controls, electric clamping of the arm and column controlled at the head, power elevation controlled at the head, automatic depth stop, constant speed arm shaft, automatic lubrication, etc."





OPERATIONS DATA

Above: Gray iron casting weighing about 5 lbs. In one set-up—drill four holes 25/64" —drill one hole 63/64"—ream one hole 1.0000/1.0001"—counterbore one hole 2½" dia. x 1¼" deep—drill two holes 23/64"—ream two holes .3750/.3751". Floor to floor time 12 minutes.

Left: 2700 lb. casting. On this set-up—bore one hole 5.001/5.002"—drill and tap six holes ¾"—drill and tap fifty-three holes ⅜"—drill two holes 47/64"—ream two holes .7500/.7501"—drill and tap eight holes ½" —rough and finish bore four multi-diameter holes, all diameters bored at one time, all concentric within .0005" cumulative error—drill and tap two holes ⅜" for taper thread —drill and tap one hole ½" and two holes for ⅜" pipe tap.

All this in 7 hours, 40 minutes. Former time with old-fashioned radial 12 hours, 10 minutes.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

– speaking from our own experience

● You are constantly being urged to profitably replace your old turret lathes with new Warner and Swaseys.

And we practice what we preach—

Sixty-two of the sixty-six machines operating in our turret lathe department are new Warner and Swaseys.

On these new machines you will see the latest turret lathe tools developed by Warner and Swasey. This combination of tools and turret lathes enables us to take full advantage of carbide cutters, to make heavier cuts at higher speeds.

How has this modernization with new turret lathes, new turret lathe tooling, and carbide turning, paid in our shop?

Time studies of 1500 typical small lot jobs supply the answer — *an average drop of 25% in machining costs, and machine capacity increased an average of 43%.*

We have taken our own medicine—and like it! Perhaps we can write a prescription for some of your turning ills. Call in your local Warner & Swasey field engineer or write.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS ... WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

RESULTS

The whir of calculating machines has ceased. Once more the office reverberates only to the din of customary tasks. For the fourth AMERICAN MACHINIST inventory of metal-working equipment has just been completed.

It was a long job, and a tedious one, requiring twice the work from industry it did from us. We feel it was worth it. We hope American industry feels the same.

For the accuracy of the figures depends on the accuracy of the reports returned in answer to our questionnaire. In this day of endless surveys and countless questionnaires it's instinctive to toss another into the wastebasket; but by and large, the metal-working industry responded nobly. The cooperation is deeply appreciated, and in a measure repaid by the statistics in this issue. They should prove invaluable to all metal-working establishments, large or small. How? Some of the ways are discussed on the next page.

What does the inventory reveal? Not only the distribution of metal-working equipment throughout American industry, but also the percentage over ten years old, page 356. What is the picture by industrial groups? The answer is on page 358. Just what products are included in each group? They're listed on page 360. Where are the country's machine tools located? A map on page 363 shows their distribution. What is the value of equipment purchased by various industries in the past five years? Figures are on page 364. How were all these figures compiled? For the statistically inclined, an explanation is provided on page 365. What does the machine do for the public? Turn to page 366 for some examples—and for some chuckles. Should you buy new equipment now? On page 368 begin a number of reasons why.

THE WRIGHT WAY

Appropriately enough, this issue includes a description of one of the best examples we've seen of a truly modern plant. That's the new Wright engine factory in Paterson, N. J. Engine production is one of the bottlenecks in this country's aircraft industry, so the efforts to solve some of its pressing problems are

P. W. BROWN

well worth study by other industries too. Wright, for instance, has to use the most modern machinery to achieve the necessary quality, but is perpetually having to cope with constant design changes and with varying rates of production. How the new plant has been laid out to achieve the utmost in flexibility without sacrificing production is described on page 371 by P. W. Brown, general factory superintendent, and H. E. Linsley.

DOG DAYS

When we were working in the shop we always used to welcome the coming of spring. It was then that we could open the door to let in a box car without freezing, and munch our sandwiches lolling on the castings piled out in the yard. But it was only a couple of weeks, it seemed, until the castings got too hot to sit on, and our brow became a little too sweaty for comfort. On turbine test especially, with the temperature kicking around up over 100, we sure used to pray for fall. Until we caught on to the salt tablets, that is. One with each drink of water proved a real tonic. Since then we've found more and more cases where salt might help in easing hot weather discomfort. So, with the coming of summer, we respectfully recommend Dr. C. D. Looker's article on how to prevent heat sickness. As director of research for International Salt Company, Dr. Looker has naturally kept up with the latest developments. You'll find his advice on page 375.

DR. C. D. LOOKER

BY HAND

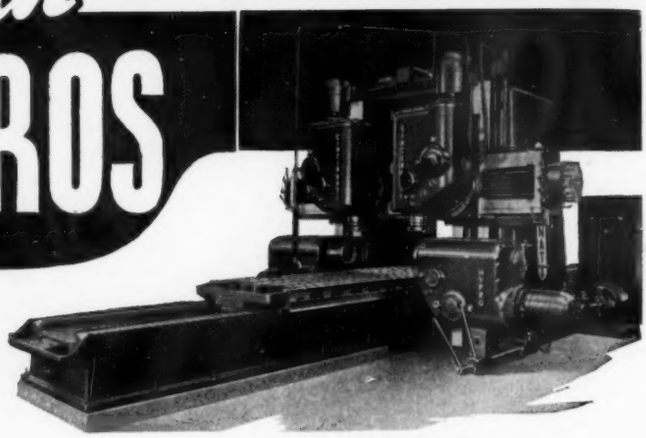
Where lots of hand finishing has to be done on mass-production parts, it takes good tooling to keep the cost down and production up. Particularly is this true of die castings, where considerable machining and finishing operations are often required. Stewart Die Casting Division of Stewart-Warner Corporation usually manages to make the best of a situation like that, though, as in the case of automobile engine fuel pump brackets. Production of these parts is 4,000 a day, but only four men are needed to perform the subsequent machining and finishing operations. The tooling set-up should prove of interest to all firms having to do light machining on thousands of parts. The description, with plenty of pictures, is on page 382.

COMING

You've heard a lot about educational orders; maybe you've even had some yourself. In any event you'll certainly be interested in the case history of a firm that has. That firm is R. Hoe & Company, printing press maker, which has been "educated" to make recuperator mechanisms for anti-aircraft guns. The whole procedure, from start to finish, will be discussed in an early issue.

Also scheduled for publication soon is a new serial. This one, in four parts, will be devoted to the proper care and maintenance of dies. Written by Joseph I. Karash, of the tool design department of Reliance Electric & Manufacturing Company, it will appear in an early issue of AMERICAN MACHINIST.

MODERNIZE *with* HYPROS



OBSOLESCENCE is the simple process in a machine tool of becoming less and less productive . . . it can easily cost you the price of a new Hypro.

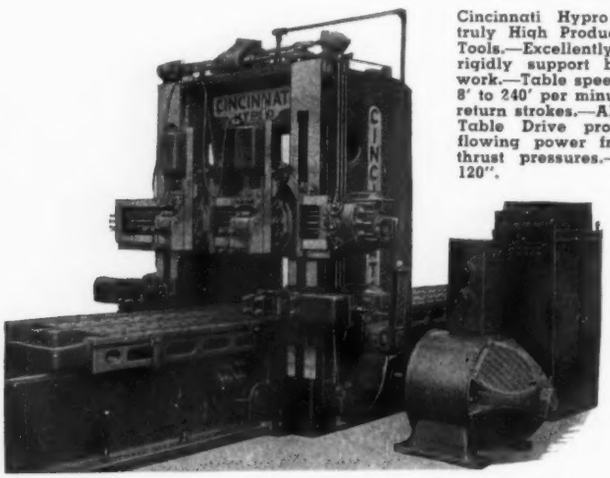
MODERNIZED Cincinnati Hypro Planers, Millers and Vertical Boring Mills are designed for modern production work of the most severe and exacting kind.—Speed, ease of operation, adaptability, and rigidity are some of the outstanding characteristics of these modern tools which assure large dividends to the cost-conscious production man.

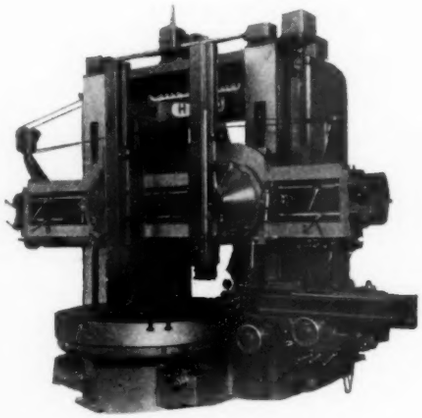
HYPRO MILLERS

Massive pyramid shape Housings,—Table Drive delivers smooth flowing power free from side thrust pressures—completely self-contained Timkenized Milling Heads—these are but three of the numerous outstanding features offered in the new Cincinnati Hypro Planer Type Milling Machine.—Sizes up to 120".

HYPRO PLANERS

Cincinnati Hypro Planers are truly High Production Machine Tools.—Excellently designed to rigidly support both tool and work.—Table speeds range from 8' to 240' per minute on cut and return strokes.—All Herringbone Table Drive provides smooth flowing power free from side thrust pressures.—Sizes up to 120".



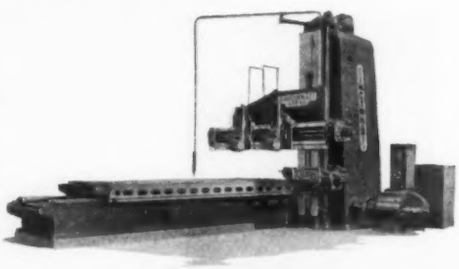


BORING MILLS

Spiral bevel table gear—completely Timkenized speed box—anti-friction, roller bearing mounted rail head saddles,—these head a long list of substantial, High Production Features built into Hypro Mills.—Sizes 4', 5', 6', 7', 8', 10', & 12', also 10-16' Extension Mill.

OPENSIDE PLANERS

Cincinnati Hypro Planers in both Openside and Double Housing Machines offer trouble-free magnetic feeds to all heads. These feeds range in increments of 64ths, from ⅛ to 1". Hypro Openside sizes up to 96".



The Cincinnati Planer Co.

Cincinnati, Ohio

About YOUR Problems

Cincinnati Hypro Machine Tools are wiping out bottlenecks and reducing machining costs in other plants like your own.—Each Hypro has many new features which will help to solve some of your most perplexing problems.—For more efficient and low-cost production in 1940, let the sincere, painstaking interest and experience of Cincinnati Engineers help you.

How OLD are your machines ?

ALMOST ONE-FOURTH of all U.S. industry consists of the fabrication of ferrous and non-ferrous metals. Some 22,000 plants are involved. They employ on the average 2,750,000 workers. They produce goods valued at $19,000,000,000 a year. Such information is public property, open to anyone interested enough to read government reports.

But no governmental agency has ever undertaken the job of determining periodically what plant facilities the U.S. metal-working industry possesses. The amount of equipment installed is important, because it gives some indication of the capacity of the industry to turn out goods for peacetime and wartime use. Just as important as the *amount* of machinery "in place", however, is the *age*.

Two plants side by side making the same product and with the same number of machines may have entirely different capacities. The one with modern high-production equipment is likely far to outstrip the other. Thus the *age* of machinery often is the key unlocking the door to increased output, more accurate work and lower costs.

Until AMERICAN MACHINIST began fifteen years ago to make an inventory of metal-working machinery, there were no figures available on the age of equipment. There was no measuring stick whereby one might determine the degree of obsolescence of America's industrial plant. AMERICAN MACHINIST's five-year inventory, started in 1925, provided that measuring stick.

Inventories were taken in 1925, 1930 and 1935. The 1940 inventory has just been completed, and its results are revealed on the succeeding pages and in the special insert accompanying this issue.

What can you get out of this inventory?

THAT IS EASY to answer. You can find out how your plant stacks up against others in your industry and against U.S. industry as a whole. And bear in mind that if you show up badly, it may well be that your competitive position in your own industry isn't as good as it might be.

One point is clear: U.S. industry is in no position to boast of its vaunted efficiency. For today a disturbingly large percentage of its plant equipment is out-of-date. You may be able to get around all right in a 1925 automobile, if you don't mind the chugs and wheezes, the amount of gasoline it takes, the number of days it is laid up for repairs, and the fact that it consumes extra time in carrying you wherever you want to go. But if time is valuable, if performance counts, if you can get around farther and more economically with more comfort in a 1940 model, you will get rid of the 1925 jallopy.

Industry is in much the same position as the car owner. It must decide for itself whether it pays to keep the old model. AMERICAN MACHINIST's 1940 inventory tells you just how old the model is.

70% are over ten years old

SEVENTY PER CENT of all metal-working equipment in American industry is over ten years old. Conversely, only thirty per cent of the machinery installed today in metal-working plants is less than ten years of age and is of relatively modern design.

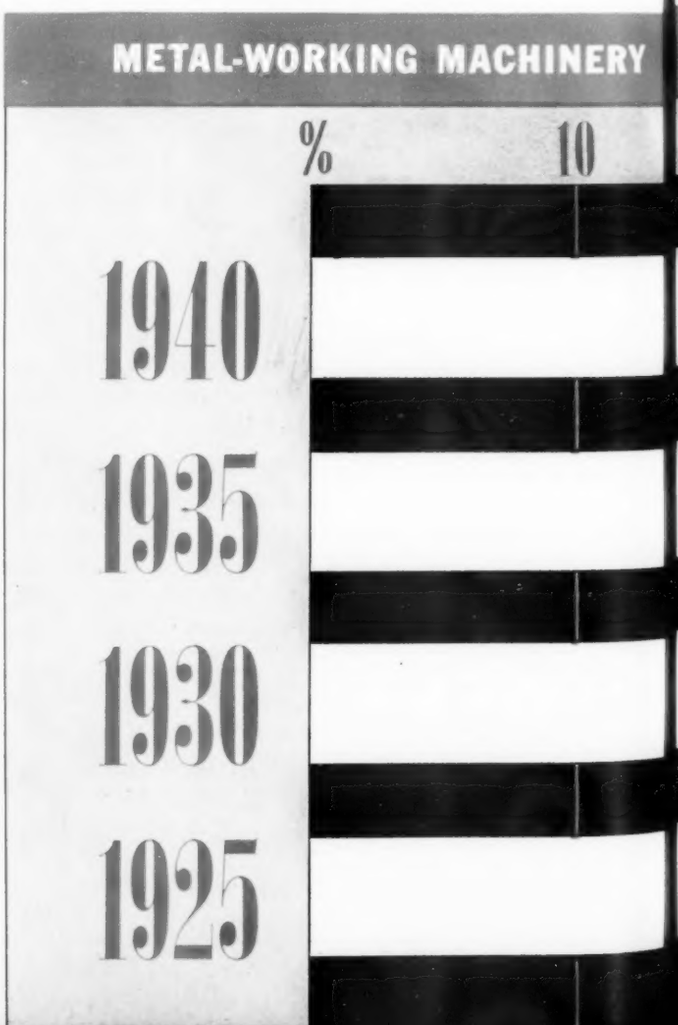
These figures represent the final results of the 1940 AMERICAN MACHINIST Inventory of metal-working equipment. To secure adequate data for the inventory 10,000 letters and questionnaires were mailed out to companies in the metal-working industry. These letters and questionnaires went into all corners of the United States, from the Atlantic to the Pacific and from the Canadian border to the Gulf. They were sent to all branches of the industry, to large shops and small, so that the final figures would be accurate for the metal-working industry as a whole.

The response was grand. Many large companies put men to work for days computing the data for their plants. When finished, the figures were passed along to AMERICAN MACHINIST in confidence with the understanding that only the over-all results for various branches of the industry and for the entire industry would be published. The job of tabulating the data and coordinating the figures was tremendous.

The final results show that ground has been lost rather than gained in the past five years in cutting down the huge amount of obsolescence which exists in the metal-working industry. Though much has been written about the unexcelled efficiency of U. S. manufacturing establishments, the fact is that the average plant at present is not as up-to-date in its machinery as it was fifteen years ago.

Nor is industry as modern as it was ten years ago. In 1925 only forty-four per cent of all metal-working equipment was over ten years old. In 1930 the figure was forty-eight per cent. During the worst years of the depression, 1930–1935, little was spent for replacement of old machinery. It is not surprising that during those years the degree of obsolescence rose alarmingly. In 1935 approximately sixty-five per cent of the machinery in metal-working plants was over ten years old.

The inventory reveals a further recession during the past five years. The years 1935–1939 were not without prosperous periods when large sums were expended for replacement



of old equipment. But however sizable the expenditures, they failed to balance the scales down on the side of modernization. They did not offset the large amount of machinery bought from 1925 to 1930 which has crossed the ten-year mark.

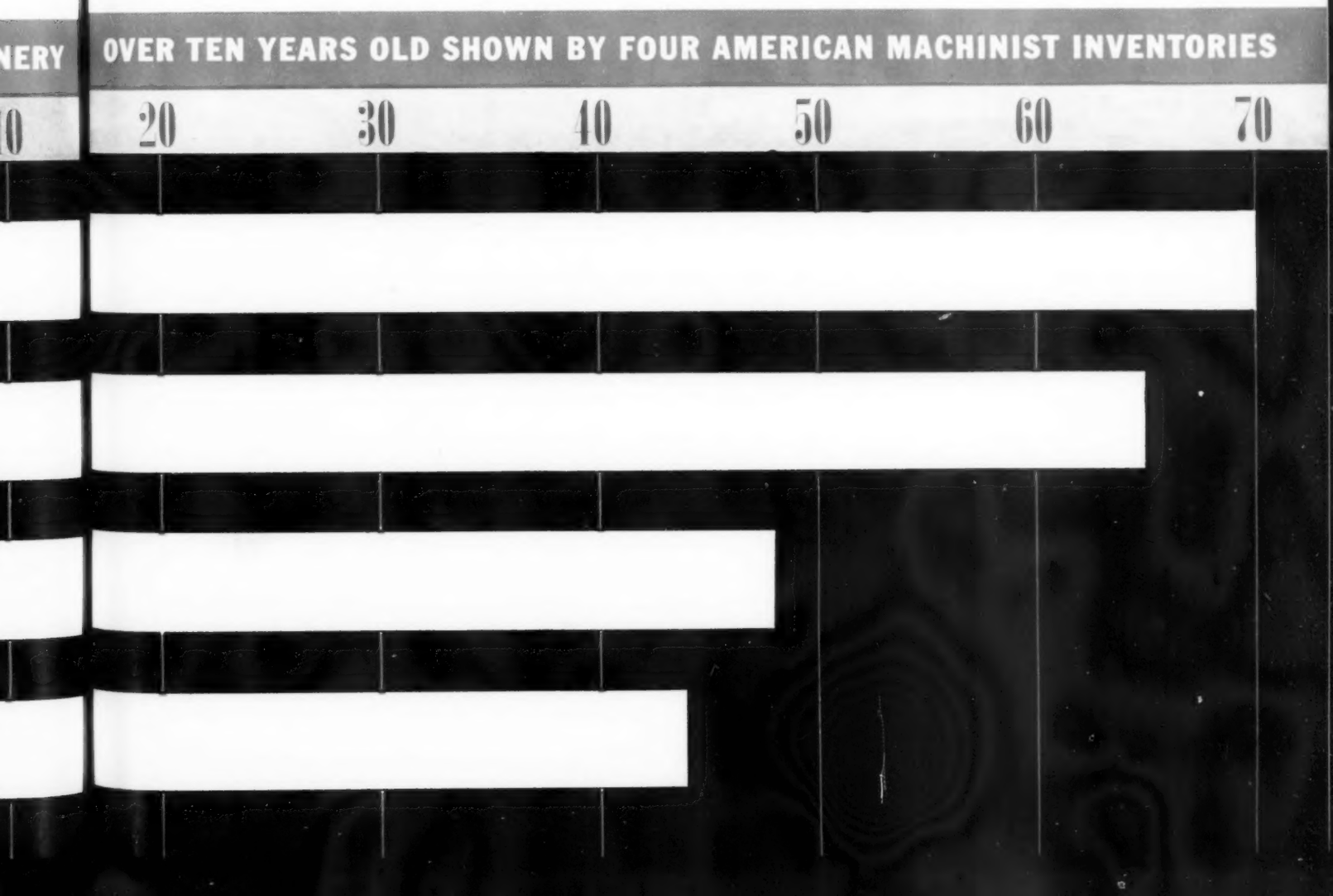
Out of the survey come some inescapable conclusions. One is that metal-working companies, for one reason or another, have not been willing to make adequate investments for plant equipment replacement purposes. How much of that hesitancy is traceable to uncertainty of the times, to lack of funds, to lean profits, to increased governmental controls, is anybody's guess.

Another conclusion is that U. S. industry is failing to use the technological advances of the last ten years. These advances make possible the continuation of the policy which built American industry to a position of preeminence. That policy is to produce goods at low enough cost that they can be sold at a price level enabling most people to purchase them. Henry Ford built his business on such a foundation. American mass production is dependent on the successful working of that policy.

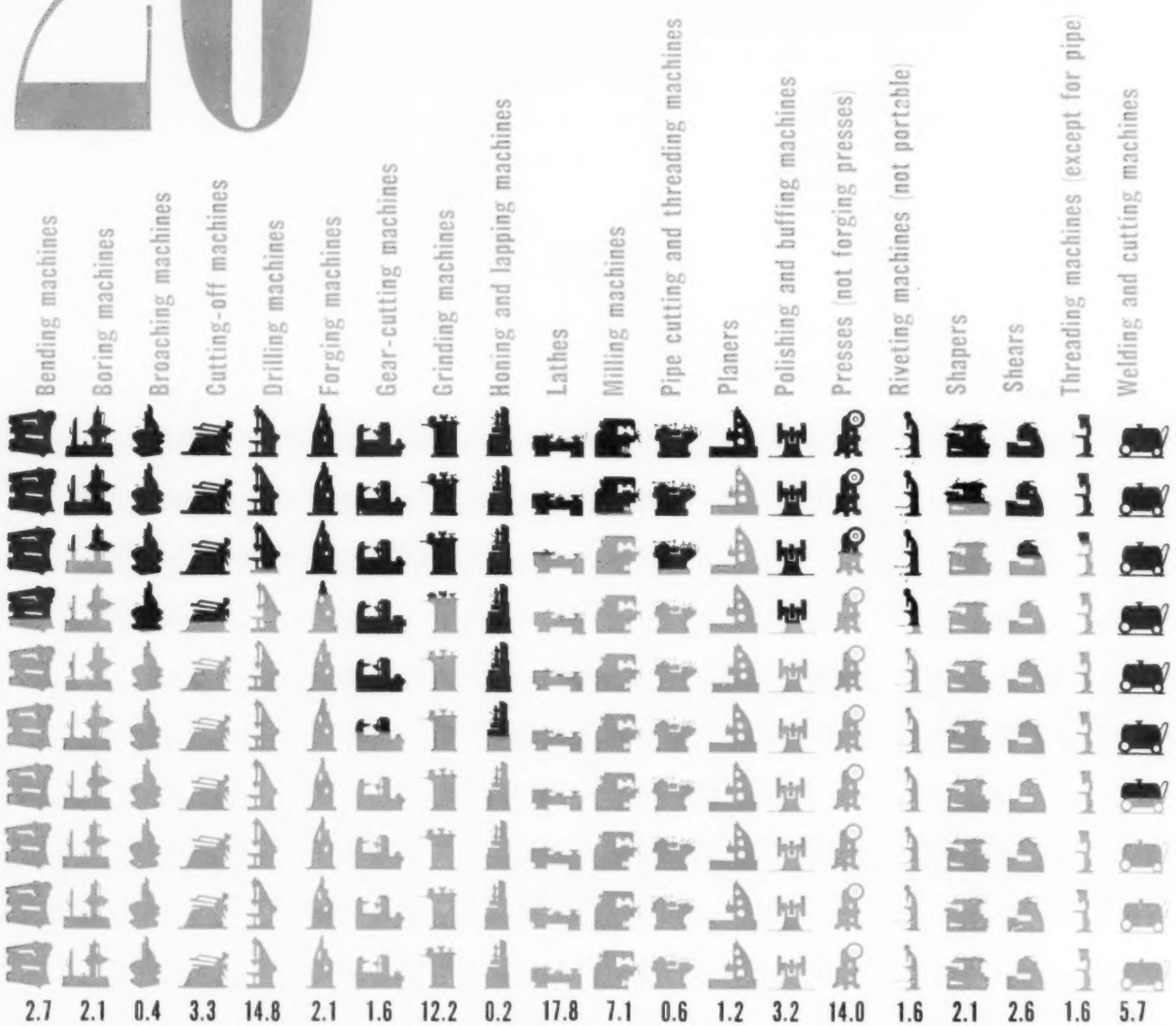
Yet if the low-price mass-production policy is to continue, U. S. industry must stay abreast of technological advances. AMERICAN MACHINIST's latest survey shows a big lag between the placing on the market of modern equipment and its adoption by any considerable percentage of U. S. industry. That lag is by no means confined to mass production plants. It is just as prevalent in job-lot shops, and in many cases more prevalent.

To clarify matters and to avoid any misunderstanding, AMERICAN MACHINIST wishes to point out that whether a machine falls on one side or other of the ten-year age mark does not necessarily determine whether it should be discarded or not. The ten-year figure was chosen arbitrarily as a measuring stick to put alongside U. S. metal-working equipment to find out its comparative age.

The fact is fully recognized that some types of equipment over ten years of age are competent to do a good job and should not be replaced merely because they are over that age limit. At the same time AMERICAN MACHINIST realizes that much equipment under ten years old already is obsolete in that newer and more efficient machinery has been developed to do the same work.



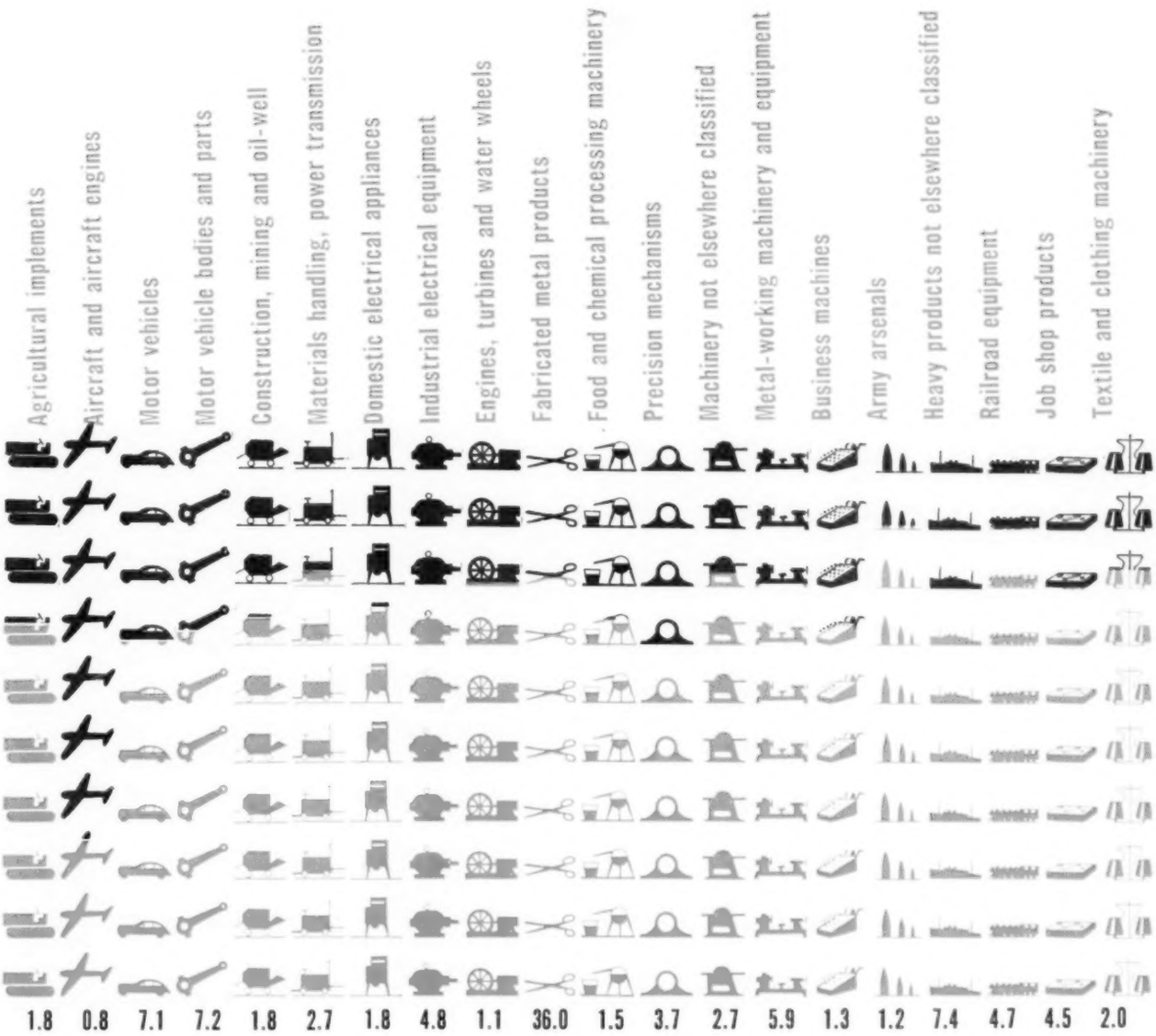
20 machine types and



Percentage of Equipment Over Ten Years Old by Machine Types

FOR CONVENIENCE in appraising the relative age of metal-working equipment by machine types, 20 major classifications have been used. These are shown above in graphical form with each machine unit representing ten per cent of the total. The machines over ten years old are reproduced in red and those under ten years old in black. Obviously a high speed automatic machine designed for mass production is subject to greater variation in design than heavy equipment devoted to engineering manufacture. For this reason, certain types of machines are inherently longer lived than others. The fact that one machine type shows a higher percentage of old equipment than another, does not necessarily mean that its development has been slower. Figures show percentage of each machine type compared to the total machines in place.

twenty industrial groups


Agricultural implements
Aircraft and aircraft engines
Motor vehicles
Motor vehicle bodies and parts
Construction, mining and oil-well
Materials handling, power transmission
Domestic electrical appliances
Industrial electrical equipment
Engines, turbines and water wheels
Fabricated metal products
Food and chemical processing machinery
Precision mechanisms
Machinery not elsewhere classified
Metal-working machinery and equipment
Business machines
Army arsenals
Heavy products not elsewhere classified
Railroad equipment
Job shop products
Textile and clothing machinery
1.8 0.8 7.1 7.2 1.8 2.7 1.8 4.8 1.1 36.0 1.5 3.7 2.7 5.9 1.3 1.2 7.4 4.7 4.5 2.0

Percentage of Equipment Over Ten Years Old by Industrial Groups

JUST HOW metal-working machines are distributed by industrial groups is shown above. Each red machine represents ten per cent of equipment over ten years old; each partially red machine represents an additional percentage less than ten. Thus the agricultural implement group has 67 per cent of its metal-working machines over this age limit. The important point to note is that the tractors, airplanes, etc., used to symbolize the various groups do not mean that this inventory applies to the products of these divisions. In every case the percentage refers to the shop equipment employed. Figures under each column indicate the percentage of total machines used in each industry as compared to the metal-working industry as a whole. For details of the industrial breakdown, including average yearly equipment expenditures, see the following pages.

Products manufactured by the 20 industrial groups

1 Agricultural implements

Harrowing, plowing, planting, cultivating, harvesting and threshing machinery; Lawn mowers; Tractors and tractor engines.

2 Aircraft and aircraft engines

Aircraft engines; Aircraft parts, except electrical parts and tires; Complete aircraft.

3 Motor Vehicles

Ambulances; Chassis; Fire department apparatus; Hearses; Motorcycles and side cars; Motor buses; Passenger vehicles; Taxicabs and other commercial vehicles; Trucks and truck tractors.

4 Motor vehicle bodies and parts

Bus bodies; Parts (axles and axle shafts, brakes and brake parts, bumpers, oil and air filters, frames, heaters, horns, instrument board assemblies, piston rings, propeller shaft assemblies, radiators, rear axle housings, rims, shock absorbers, steering gears, third axle attachments, transmissions, wheels); Passenger car bodies; Trailers; Truck and commercial bodies.

5 Construction, mining and oil well equipment

Cement and concrete machinery; Cranes and derricks; Dredging, excavating and road building machinery; Mining machinery; Oil-refinery machinery; Miners' and contractors' portable pneumatic tools; Stone-working machinery; Well-drilling machinery.

6 Materials handling, power transmission equipment

Air compressors; Blowers and fans; Conveying machinery; Elevators; Industrial and mining cars, trucks and tractors; Power transmission equipment (chains, sprockets, gears, speed reducers); Pumps and pumping equipment; Stokers.

7 Domestic electrical appliances and equipment

Household appliances; Phonographs and accessories; Radio-phonograph combinations; Radio receivers; Refrigerators; Washing machines, wringers, driers and ironing machines.

8 Industrial and commercial electrical equipment

Batteries; Commercial radio transmitters and receivers; Electrotherapeutic and electromedical apparatus, including X-ray; Generators and motor-generator sets; Heating units and devices, except industrial furnaces and ovens; Miscellaneous radio equipment; Motors, except railway; Fans and control apparatus, except railway and vehicle; Rectifying apparatus; Switchboard apparatus; Transformers, reactors and voltage regulators; Wiring devices and supplies.

9 Engines, turbines and water wheels

Internal combustion engines, except aircraft, railway and tractor; Steam engines and turbines; Water wheels and turbines.

10 Fabricated metal products

Aluminum products, except electrical appliances; Bicycles; Bolts, nuts, washers and rivets; Children's carriages and other wheel goods, sleds and skates; Collapsible tubes; Cutlery (table cutlery, scissors, shears, snips, clippers, razors, dry shavers, razor blades, pocket knives, butcher knives and cleavers); Dentists' burrs,

drills, hand instruments, sterilizers and equipment units; Doors, shutters, window sash and frames, molding and trim; Drawing instruments; Flexible metallic tubing and hose; Fire extinguishers; Furniture, including store and office fixtures; Gold leaf and foil, tin and other foils; Hand tools (agricultural edged hand tools; axes, adzes and hatchets; augers and bits, gimlets and countersinks [wood-working only]; chisels, except cold chisels, gages; dies for cutting cloth, paper, leather; draw-knives and spoke-shaves; files, forks, hoes, rakes, shovels, saws; household kitchen tools; mechanics' hand tools); Hardware not elsewhere classified; Heating and cooking apparatus, except oil and gas burners; Jewelry and jewelers' materials; Lighting equipment, except incandescent bulbs; Mechanical pencils and pens; Miscellaneous, including air conditioning equipment, barn equipment, gas generators, sprinkler systems, etc.; Motor scooters; Musical instruments, including organs, cup-mouthpiece instruments, saxophones, and accessories; Nails and spikes; Needles, pins, hooks and eyes, slide and snap fasteners; Nonferrous metal products not elsewhere classified; Playground equipment; Plumbers' supplies (enameled iron sanitary ware, tanks and shells for water heaters, range boilers, plumbers' brass goods); Refrigerators and refrigerating and ice-making apparatus, commercial and industrial; Screw machine products and wood screws; Sheet metal work not elsewhere classified; Silverware and plated ware; Springs; Stamped and pressed metal products; Surgical instruments; Tin cans and other tinware not elsewhere classified; Toys and games; Valves, faucets and fittings; Watch cases; Water filters and softeners; Wheelbarrows; Wire drawn from purchased rods and fabricated wire products; Wirework not elsewhere classified.

11 Food and chemical processing machinery

Bakers' machinery; Bottling machinery; Canning machinery; Coffee roasting and grinding machinery; Confectionery and ice cream machinery; Dairy machinery; Flour-mill and grain-mill machinery; Food choppers and grinders, mixers, slicers, etc.; Oil-mill machinery; Paint-making machinery; Paper-mill and pulp-mill machinery; Pharmaceutical machinery; Sugar-mill ma-machinery.

12 Precision mechanisms

Ball and roller bearings; Cameras, including motion picture; Clocks, watches and time recording devices, including electric clocks; Firearms; Fishing rods and reels; Flow indicating, recording and controlling equipment, including gas, water and electric meters; Instruments, meters and relays, electric; Machinery and mechanism parts and attachments not elsewhere classified; Nautical and navigation instruments; Oil and gas burners, except boilers and furnaces; Optical instruments; Other metal instruments and apparatus; Pressure indicating, recording and controlling equipment; Projectors and other optical apparatus; Pyrometers; Safes and vaults; Scales and balances; Speedometers; Surveyors' instruments; Tachometers.

13 Machinery not elsewhere classified

Beauty shop machines; Clay-working machinery; Coin-operated machines; Dish-washing machines; Glass-making machinery; Laundry machinery, commercial; Leather-working machinery; Packaging machinery; Paper container machinery; Presses, other than metal-working; Printers' machinery and equipment; Pulverizers, fuel and otherwise; Rubber-working machinery; Tobacco-products-making machinery; Wood-working machinery.

14 Metal-working machinery and equipment

Foundry machinery; Furnaces, heat-treating and other industrial types; Machine tools, including bending machines; Machine tool accessories, including cutters; Machinists' precision tools; Other metal-working machinery; Precision measuring tools; Welding apparatus, gas and electric.

15 Business machines

Adding and calculating machines; Cash registers; Typewriters.

16 Army arsenals

Rifles; Small arms; Medium and major caliber guns; Coast defense and anti-aircraft guns; Gun carriages; Ammunition; Fuses; Explosives; Fire-control instruments; Tanks.

17 Heavy equipment not elsewhere classified

Boiler shop products; Cast iron pipe and fittings; Cold-finished bars and strips; Fabricated pipe; Forgings; Foundry products; Ship building and repairing; Steel barrels, kegs and drums; Structural and ornamental metal work; Wrought pipe, welded and heavy riveted.

18 Railroad equipment

Cars, electric and steam railroad, including self-propelled; Locomotives; Railway car engines; Repair work on above.

19 Job shop products

General jobbing and machine shop work, including repairing and experimental.

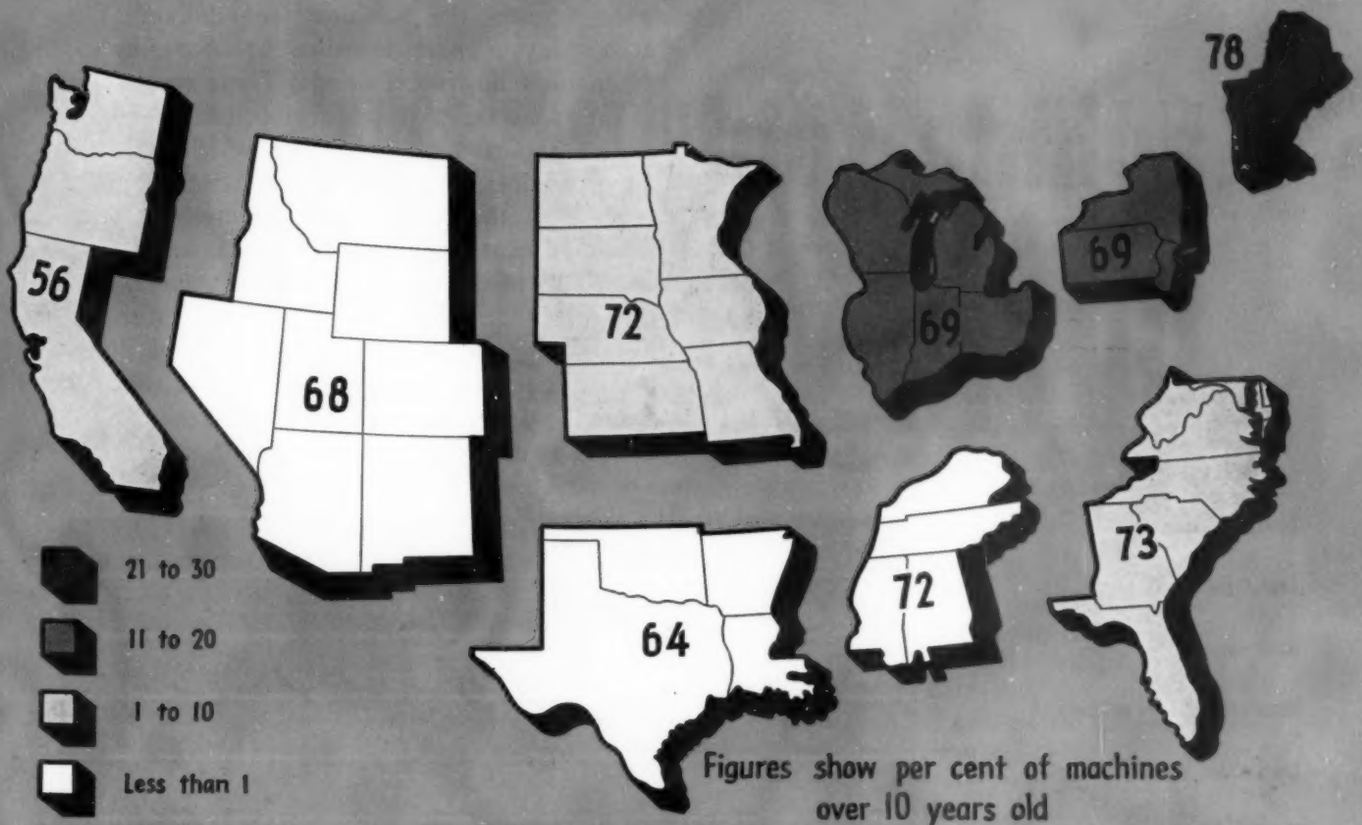
20 Textile and clothing machinery

Clothes-pressing machinery; Sewing machines and attachments; Shoe machinery; Textile machinery and parts.

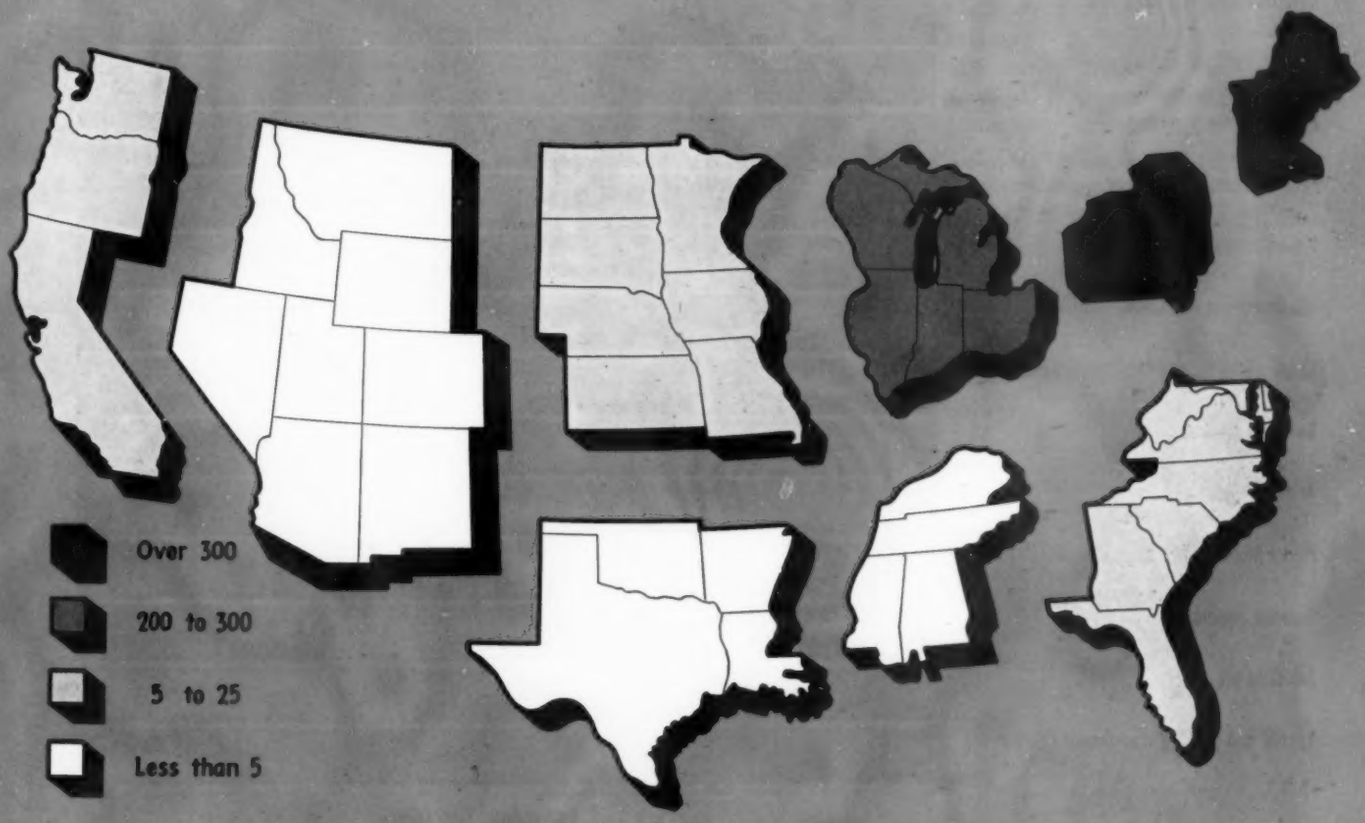
Across the map

METAL-WORKING EQUIPMENT in the United States shows a high degree of concentration. The total units in place have been broken down into nine geographical divisions. The table shows these divisions together with their areas and populations. The number of machines per 100 sq. miles and per 1,000 persons has been computed. The maps on the facing page have been shaded according to the intensity of machines available. New England, the Middle Atlantic and the East North Central states show an overwhelming preponderance of mechanization. The percentage of machines over ten years old in each division is also indicated.

	Machines In Place	Machines Over 10 Years Old	Per Cent Over 10 Years Old	Area Sq. Miles	Machines Per 100 Sq. Mile	Population ÷1,000	Machines per 1,000 Population
New England Maine, New Hampshire, Vermont, Massachusetts Rhode Island, Connecticut	257,038	200,508	78	66,424	387.0	8,597	30.0
Middle Atlantic New York, New Jersey, Pennsylvania	365,504	255,424	69	102,554	365.0	27,478	13.3
South Atlantic Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida	58,092	42,631	73	282,910	20.5	17,260	3.4
East North Central Ohio, Indiana, Illinois, Michigan, Wisconsin	514,844	353,273	69	248,105	207.5	25,841	20.0
East South Central Kentucky, Tennessee, Alabama, Mississippi	6,935	4,980	72	181,483	3.8	10,731	0.7
West North Central Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas	66,172	47,342	72	518,379	12.8	13,819	4.8
West South Central Arkansas, Louisiana, Oklahoma, Texas	11,480	7,402	64	437,794	2.6	12,900	0.9
Mountain Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada	3,699	2,522	68	865,017	0.4	3,792	0.9
Pacific Washington, Oregon, California	28,837	16,252	56	324,123	8.9	8,839	3.3



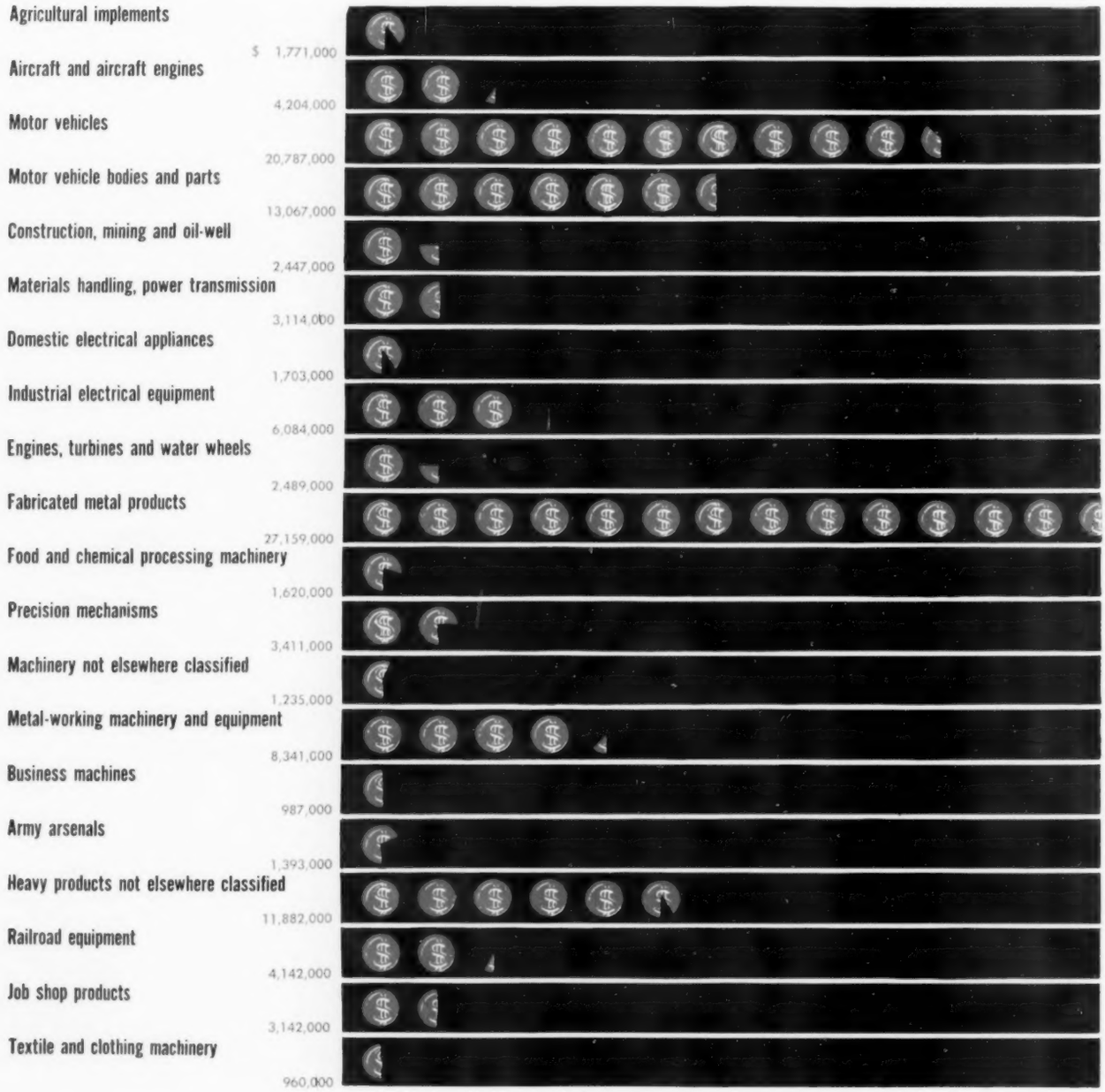
MACHINES PER 1,000 PERSONS



MACHINES PER 100 SQUARE MILES

Machine tool buying

WHO SPENDS the machine tool dollar? The accompanying chart furnishes the answer by the 20 major industrial divisions. These results are taken from expenditures during 1935-1939 inclusive reported by companies which returned questionnaires. Percentages thus obtained were applied to the dollar value of machine tools produced during the years 1935 and 1937 according to the Census of Manufactures. Figures for 1936, 1938 and 1939 were estimated by applying the National Machine Tool Builders index to the census figures. A deduction for foreign sales gave the value of machine tools bought by domestic users.



Each Coin Represents Two Million Dollars

CROSS SECTION OF AN INDUSTRY

IN THESE PAGES and on the large table which accompanies this number are set forth the findings of *American Machinist's* 1940 Inventory of Metal-Working Equipment. Some readers will accept them on our say so. Others will want to know how we arrived at these figures. In order to satisfy this latter group the procedure for conducting this inventory is outlined below.

A questionnaire was sent to over 10,000 companies in the metal-working field. It contained the machine classification shown on our large table with columns for total machines in place and for those over ten years of age. It also asked the recipient to state his principal products, his number of employees as of December 15, 1939, and to give the amount spent on new equipment during certain five-year periods. The information on the questionnaire is held confidential, its use being confined to a compilation of the overall figures given in this inventory.

Naturally not every concern was able or willing to cooperate with us in compiling these figures. The result was a sampling survey such as has been popularized by the various polls of Dr. Gallup, but which has been used in each American Machinist Inventory since 1925. Since partial returns are received for each industrial subdivision, it is necessary to determine just what percentage of the metal-working industry is represented by the returns received. This is done through the use of the number of wage earners reported. In each industrial subdivision the total wage earners on the questionnaires received for a given industrial subdivision are compared with the corresponding Census of Manufactures wage earners for the same industrial classification. The latest Census of Manufactures was that covering the year 1937. In order to make the census wage earners comparable to those used in this inventory, the index compiled by the Department of Labor was introduced. The census figures were modified by the ratio of labor index of employment during 1937 to that for December, 1939. In short, the wage earner totals for each industrial division were brought up to date.

These revised figures were then compared with our wage earner totals on the questionnaires. By simple division an extension factor was obtained. If it was found, for example, that the census showed 60,000 wage earners making agricultural implements and the questionnaires received for this group gave 12,000 men, a factor of 5 was applied to the machines reported for this same group in arriving at the final totals. The use of an extension factor assumes that, for a given industrial division, the ratio of men to machines is substantially constant. Naturally, some industrial subdivisions gave better returns than others. This method of handling, however, gives the proper weight to all groups by extending the returns for each according to the proportion of the industrial classification represented by them.

Thus weighted, the figures were combined first by industrial groups, and then by geographical divisions. These are the figures shown in the large table and in the various graphical presentations which are based on these tables.

In previous surveys, the question has been raised as to why a ten year dividing line is used between old and new machines. Some readers have inferred that this is offered as a definite point of obsolescence. Such is not the case. The ten-year mark is taken as a convenient yardstick. It is fully realized that many machines over this age have useful life and that many under this age could well be replaced with better equipment. Obsolescence is a factor dependent upon the machine itself, the nature of the business in which it is used, the degree of activity, the prospects of future business, and the likelihood of change in design in the product. The ten-year dividing mark serves to compare one inventory with the next, one industrial classification with another and one machine type with the others.

Public servant No. 1

MOST PEOPLE like machines. Glistening shafts and whirling gears have a fascination all their own. But, for observant individuals, the attraction goes beyond the steady buzz of a busy shop. They know that machinery produces jobs, that it removes back-breaking drudgery and that its products enrich the lives of millions of people.

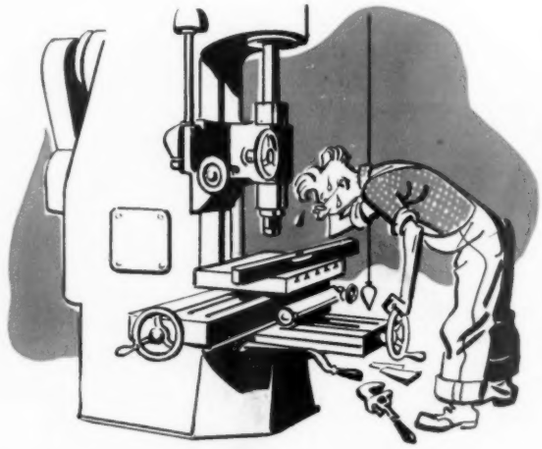
The machine has its enemies—yes. They see only the temporary displacements caused by the machine and blame it for unemployment. A big majority, however, recognize that the test of time has proved that the machine's merits far outshadow its faults.

Pictured here are a few people who have profited by the machine. Their vote is for the machine as Public Servant No. 1.

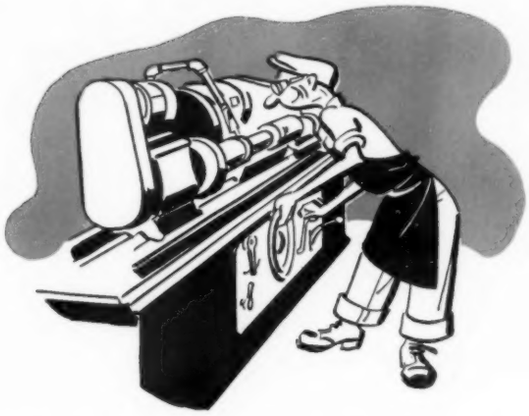
SAMMY STEELE is one of many who make the materials from which the machine is built. Then he makes more material that goes into the products turned out by the machine. He knows that without the machnie these materials could not be used fast enough to support his industry

KARL KABUSE works on the railroad. He brings in the parts and materials that go to make up the machine; he also carries away the finished product after it has been built. Not only that but the train he works on is pulled by a machine, and machines maintain the entire railroad system

FREDDIE FITTS builds the machine and takes a pride in it, too. He gets just as much joy out of his work as the sculptor who chisels out a statue. And why not—the statue will give cultural return to those who appreciate its beauty, but the machine will bring material return to thousands who never see it



PETER PLUMB sets up the machine. He knows that unless it is installed right it won't work right. Then, all the effort that went into building it will have been lost. But Pete is not thinking so much of the work that went into the machine; he's thinking of the fine work that it will turn out when it starts operating



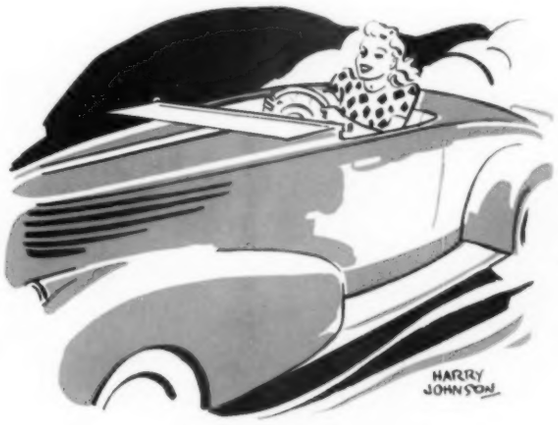
CHARLIE CHIPS runs the machine. He feels toward it just as a golfer feels toward his favorite iron. He knows its strength and its weakness, and uses this knowledge to get the best results. The machine is a servant which does work beyond Charlie's own strength and with precision he could never approach alone

CASEY CLINKER helps generate the power that drives the machine. He sees the boilers bubbling with energy and likes to think about the useful work this energy will do. Casey knows all about the turbines that produce power and also about those other machines that turn this power into constructive channels

SAM SERVICE is a master mechanic. He takes as much pride in his M.M. as many doctors do in their M.D. The machine is his patient, and he sees that it is kept in repair. He doesn't consider his job well done unless breakdowns are forestalled. "Preventative maintenance" Sam likes to call it

MARY MITE is a widow—not exactly a "Merry Widow", but one who finds much contentment in life. A provident husband left her some securities in a company whose profits hinge on the use of machinery. Mary's purchasing power, her welfare and independence are an important by-product of the machine

DAN DIGIT works in the cost department. He figures out the payroll and makes up the shop costs. He is typical of thousands of white-collar workers whose jobs depend on the machine. The figures he compiles are not tiresome records. Dan sees in them the romance of creating real wealth from the earth's raw materials



WINNIE WHEELER is driving her new automobile. She's proud of it and calls it a fine "machine". And so it is. It was manufactured by fine machines too. Winnie is going to get a lot of pleasure out of that machine, as are thousands of others everywhere who live better lives because of machine-made goods

We spend our depreciation on new equipment. This seems like as good a yardstick as we can find. The result is we have a modern machine shop.

We replaced about 20 per cent of our machine tools during 1939 and have about the same program for this year. As our products require very high grade, accurate machinery, we are influenced most by the improvement made in machine tool equipment. Higher production per worker is also important.

Our purchases of new machinery are based on increased manufacturing efficiency, plus development of new products requiring closer tolerances.

Competitive conditions on quality are perhaps responsible for more new money being spent in our industry than any other reason. If we are going to maintain our position, we must produce surface and physical requirements the equal of competitors or we do not get the business.

We have bought new equipment 1) to make better use of available cutting steels, 2) to make a more precision product, 3) to get better production from the floor space occupied, and 4) to manufacture new products.

The efficiency of machine tools is increasing so much that it would be folly not to replace equipment as quickly as possible and adopt something which uses the latest type of metals and designs. In other words, obsolescence travels at a faster pace than depreciation.

Every corporation desiring to stay in business by being of more service to its customers finds it necessary to keep its plant and equipment as nearly modern as possible.

What modern machines DO for us

THOUGH capital investments in industry haven't been what they should be the past few years, nevertheless tens of millions of dollars have been spent by U. S. manufacturers for machine tools and other productive plant equipment. What were the reasons for these large expenditures? Why does management find replacement of machinery advisable and, in many cases, imperative?

In an effort to get at the facts AMERICAN MACHINIST has asked many important machine tool buyers to set forth their views on a confidential basis. These views have been obtained by personal interviews and by letter. The opinions expressed are illuminating.

Running as a theme through most of the statements is the conclusion that *competition* forces plant modernization. One manufacturer uses the term *self-preservation* to describe why he finds it essential to keep his plant equipment up-to-date. A prominent industrialist makes this comment, "The principal reason for our investing money in new machinery during the past two years is to put our plants in shape to keep in competitive position with our competitors."

The search for *lower manufacturing costs* is another prime reason for new equipment buying. The matter of production costs, in turn, is tied in closely with labor costs and the productivity of the worker. A New England company writes, "Higher labor costs and pay-roll taxes have made expenditures for tools to reduce labor costs more advisable than ever." A manufacturer in the automotive field observes that many times it becomes necessary to make changes which improve the product regardless of cost. Under such circumstances, he says, "We must be the more alert for new methods to cut costs." A prominent railroad reports the chief reason for installing new equipment is to secure the economies from improvements in machine tools. An Ohio company attributes much of its investment in new machinery lately to the necessity for reducing costs because of high taxes and because of other expenditures caused by legislation.

High up on the list of reasons for industry's investment in new machinery is the *development of new products*. An automobile maker who has paid out millions for new equipment the last few years states that almost all its buying program is traceable to new cars added to its line. Another manufacturer declares that "the bulk of our expenditures" has been due to introduction of new products. Many other companies emphasize the weighty influence of new products in machine tool purchases.

Improvement in quality of product is a major consideration of many equipment buyers. One executive tersely says that he spends money for new machinery "to produce better goods." An engine builder frankly admits that "the standard of quality in all lines has been increasing for some years and it really requires better machine tools to meet this requirement." In the automotive industry a leading company is influenced to buy because of the introduction of new machines or methods that will perform the work more accurately. When accuracy of work is involved, machines will be purchased though they may not pay for themselves in much longer than the one to two years normally specified.

Contrary to general belief, writes a well-known production manager, "corporations buy new machinery because it is capable of producing to a closer standard of limits rather than for increased productivity. . . . Most replaced machines are old enough that the new machines are improved not only in accuracy, but in cutting tools, so obviously you get increased production." A railroad equipment builder testifies that "of prime importance is the factor of re-

finements in design and finish entering into our products which often render obsolete perfectly good and usable equipment."

Replacement of old and worn-out machines is mentioned prominently among the reasons for equipment buying. Most companies say boldly that their policy is to replace machinery as soon as satisfied it will pay for itself in a specified time. The length of time varies, the most exacting buyer being automobile manufacturers who usually set two years as a top limit and who in many cases insist that a machine must pay for itself within a single model season.

Writes a materials-handling equipment maker, "We like to replace machine tools at least as we amortize them on our books."

Certain other buying factors are not to be overlooked in appraising the reasons for new equipment purchases. One factor is to secure *greater production without increasing floor space.* Where departments are so located that an area cannot be enlarged without considerable moving of departments or without adding buildings which increase property taxes, productive capacity sometimes is expanded by installation of new machines.

A basic reason for buying new equipment, according to one company, is the attempt each year to *give the public more for its dollar.* "Our business has developed to the point," writes the manager, "that new methods are about the only way we have left to accomplish this result."

Realistically, an industrial executive comments, "It is only through keeping machinery at a high degree of efficiency that profit margins can be maintained." A railroad official says that his company buys new machine tools principally to replace worn-out facilities that no longer are productive and thus releases machine shop labor for other work.

It is our policy to replace equipment as soon as we are satisfied that savings will pay for the required expenditures at least within a period shorter than the useful life of the tools in question.

We have not been influenced by labor costs or by a wish to get more productivity per worker, but rather by a desire to increase manufacturing efficiency and to improve the quality of our products.

Higher labor costs and payroll taxes have made expenditures for tools to reduce labor costs more advisable than ever.

It is our desire to get more production per worker without penalizing the man himself. The only way to do that is to buy and use more efficient tools.

Originally a radial-drill job, the cylinder stud holes in this crankcase are drilled in a special Ex-Cell-O unit

Engines from the ground up

BY P. W. BROWN AND H. E. LINSLEY, WRIGHT AERONAUTICAL CORPORATION

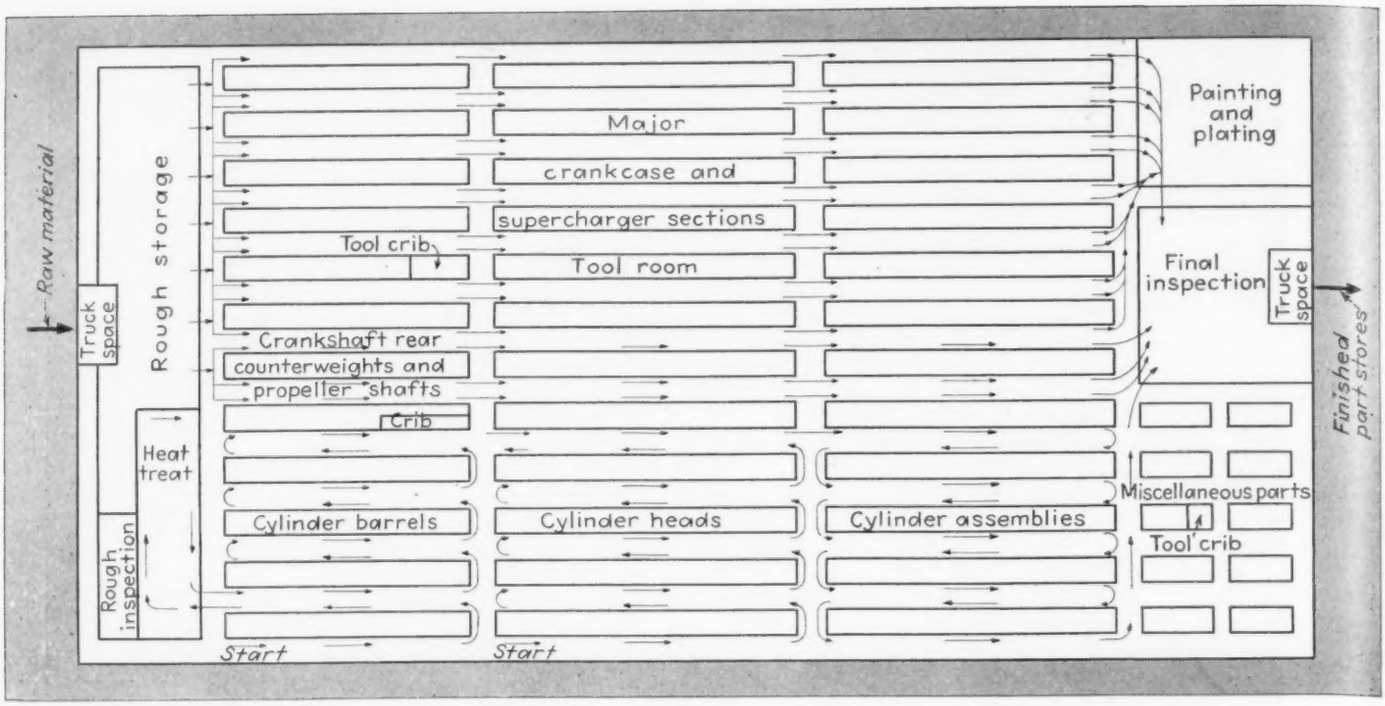
Wright's new engine plant is only a part of the expansion program now being completed. Back of it all is a carefully worked out study of needs

WRIGHT AERONAUTICAL is now set up to make aircraft engines on a mass production basis. Manufacturing lines in our new Paterson, N. J., plant are laid out for a smooth, steady flow of major parts for our three most important models.

Machines are installed in twelve double lines separated by wide aisles. Beside each machine is enough room to stack parts. Raw materials come in at one end of the 960x480 ft. steel-and-glass, single-story building and emerge, after final inspection, at the other end. The lines are broken by three main cross aisles along which materials move and which serve as terminal points for collection and delivery of parts.

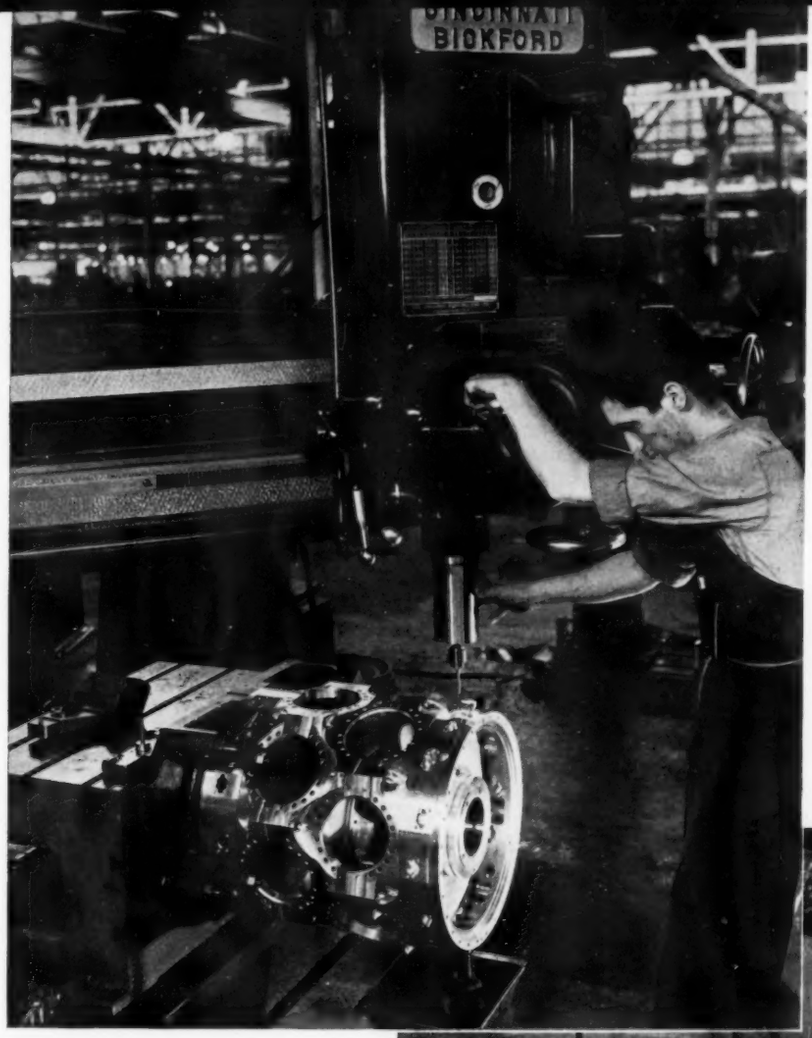
Such a layout is customary in the automobile industry where production ordinarily is restricted to not more than two models of engines. Its use in aircraft engine manufacture, however, runs into complications. The aircraft industry is constantly on the lookout for lighter and more powerful engines. Whenever they are developed, they are put into production without delay. There can be no waiting for a new model season to roll around, as in the automobile industry. No wonder then that production lines must be easily adaptable to changing needs, yet must not waste valuable floor space.

Every effort has been made in the new plant (known as Plant 2) to insure proper sequence of operations. If much processing must be done individual parts may pass down one of

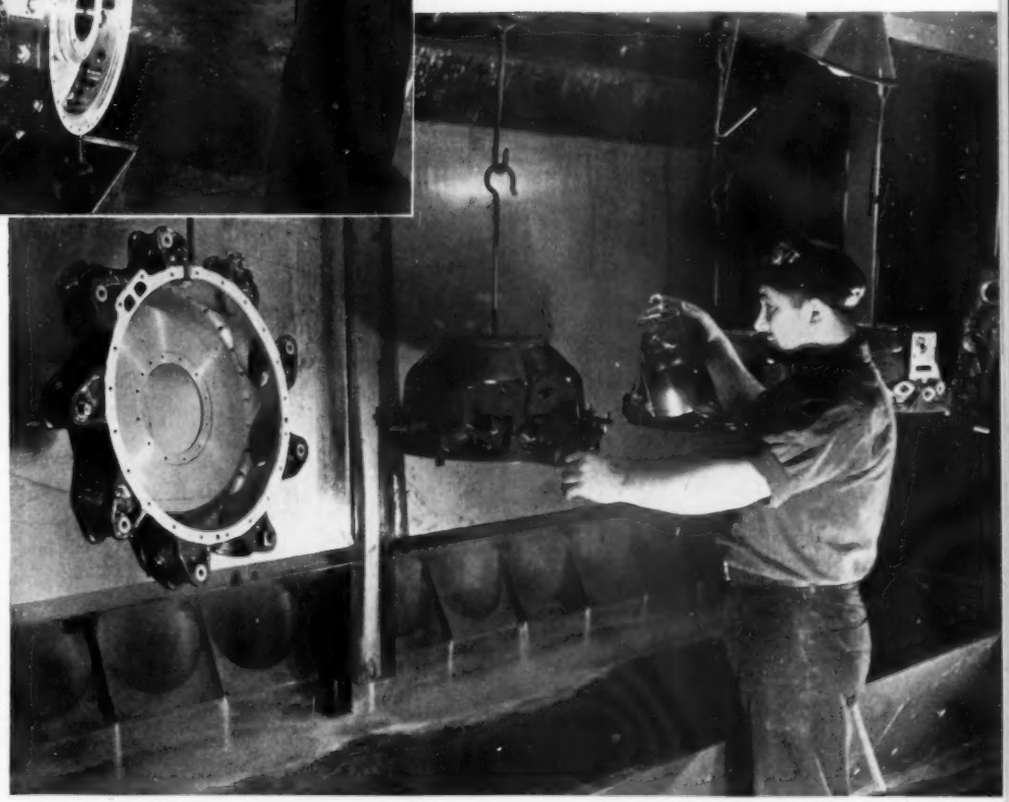


Wright's new 960 x 480 ft. building is laid out for straight-line production of major aircraft engine parts. Machines are arranged in double rows with separating aisles. Nowhere in the set-up does a part back-track on a production line. Inspected parts are delivered by truck to a storeroom in the main plant

Many assemblies are made up and inspected carefully before final assembly in an engine. This skilled workman is putting together connecting rod and crankshaft assemblies for Wright's nine-cylinder "Cyclone" single-row engine. The crankshaft rear section units shown in the foreground have Wright's featured dynamic counterweight



Standard machine tools are used for many operations, even for mass production quantities. Here a Cincinnati-Bickford radial in the new plant drills, reams and taps the oil sump pad on the aluminum crankcase for Wright's fourteen-cylinder double row "Cyclone" engine. Each set-up is checked carefully



Included in the new plant is a complete plating and spray painting department. The four spray booths are served by an overhead conveyor which also carries painted parts through a bake oven. Each booth has a water curtain and adequate ventilation to keep working conditions at a high level

the short lines, up the next line and down a third, as indicated by arrows in the accompanying layout. In each case, however, no back-tracking occurs. Parts are delivered directly to the final inspection crib upon completion of the last machining operation. Parts to be painted or plated go from the machining line direct to the finishing group before moving to the final inspector. After final inspection, parts are trucked to the finished stores and assembly departments in the main plant. An automatic cleaning and tin plating unit is located in the cylinder barrel line so that partially machined barrels pass through it and then to adjacent nitriding furnaces before going to the head of another machining line.

The tool crib and toolroom are located near the center of the building for the convenience of machine operators. Machine repair and cutter grinding work is done in the toolroom. Washrooms, raised to a 17-ft. level so as not to occupy manufacturing space, are placed at intervals along the walls. At one end of the building is a two-story structure with space for factory offices, main washrooms and locker rooms. A railroad siding and platform are located along the north side of the building.

Of particular interest in this new plant is the finishing room where modern methods of painting and plating are employed. Parts to be plated are cleaned by the Bullard Dunn process, then delivered to plating tanks which are arranged so that their tops are at a height of 30 in. above the floor and set in drain trenches communicating with a central drain. Aisles between tanks are floored with steel grating to avoid puddles. All piping is carried underground in drain trenches. Buss bars for distribution of electric current are located between and behind the tanks where they are protected against contact by work or operators. Fumes are removed by an efficient exhaust system. Each plating tank has a built-in current density meter, plating procedure and solution control being under the supervision of the Works Laboratory.

Establishment of the new plant and rearrangement of manufacturing fac-

ilities in the main plant make it possible to produce all engine models in large or small lots by the most economical procedure. The entire revamping and expansion program has required purchase of about 1,250 machines, including foundry and heat-treating equipment. Almost 100 of these are of special-purpose design.

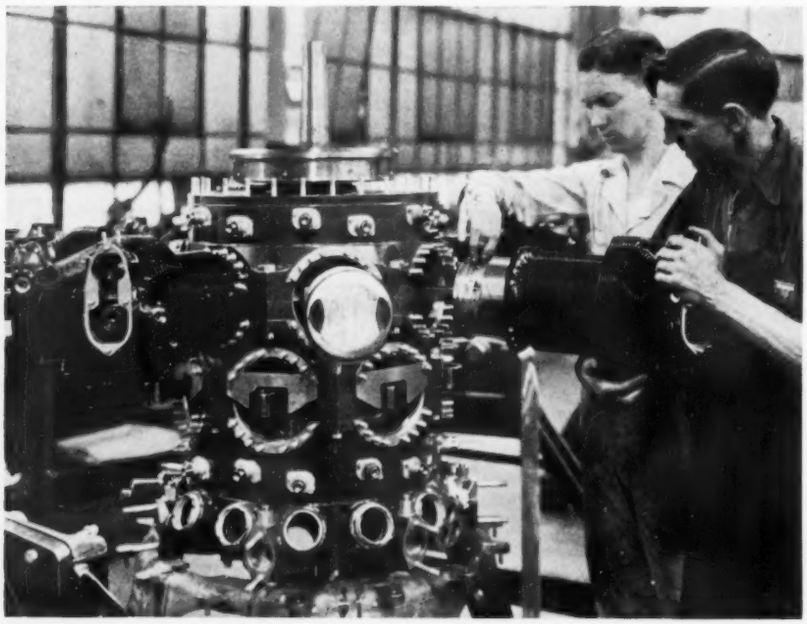
Four Phases of Production

When considering the problems faced in rearranging manufacturing facilities for straight-line production in place of previously used job-lot production methods in aircraft engine manufacture, it is of interest to review the four manufacturing phases encountered. Unlike the introduction of a new automobile, the advent of a new aircraft engine usually is not heralded by the maker with a fanfare of world-wide publicity. Rather, it is made known only after its existence is revealed by the granting of an Approved Type Certificate by the Civil Aeronautics Authority.

Again unlike the automobile, the design is created not by the desire to increase sales in the face of competition, but as the result of careful surveys made to determine the requirements of the aircraft industry as a whole. There would be no point in designing an engine, at a cost of several million dollars, if the airplane manufacturer cannot make use of it. In certain cases, of course, a new design may be initiated at the request of a government agency which lays down certain specified requirements.

All "wrinkles" in a new engine must be ironed out in a testing laboratory so that only minor adjustments need be made when the time comes for experimental test flights. Engine failure in an automobile usually means no more than temporary inconvenience, but the failure of an aircraft engine in flight may well cost the life of a valuable pilot and result in the loss of hundreds of thousands of dollars worth of work.

Basic engineering and stress analysis work, together with tests on a single-cylinder model, usually are completed before an experimental aircraft engine is built. Usually four such engines are constructed, together with a sufficient supply of spare parts to insure against undue delay should some part fail during tests.



All assembly operations on Wright aircraft engines are performed in a separate building by carefully trained artisans. This double-row "Cyclone" engine soon will be in a test cell for run-in and performance tests before delivery to the customer

Before building the experimental engines, the engineering drawings are checked carefully from a production standpoint to make sure that the part may be machined as required, and that limits specified are necessary and can be held in production. Toolroom methods are employed by the experimental department in making these engines. Only standard machine tools are used and only simple jigs and fixtures are made. These first engines are subjected to months of testing. Difficulties are encountered and overcome and all pertinent data collected. In the interim the production planning department has made ready temporary operation sheets for limited production requirements, and has ordered semi-production tools.

When all tests have been completed, and the test engine granted its A.T.C. after a 150-hr. test run, a limited-production lot of 25 to 50 engines is started. These are known as model engines, and are distributed to aircraft manufacturers, airlines, and the U. S. Army and Navy for experimental and flight testing. In the main, standard machine tools must be used in producing these model engines, although in certain instances special-purpose machines may be employed.

While the model engines are being built and field tested, production operation sheets are being prepared for normal production. New machines and equipment are ordered, special jigs and fixtures are designed and constructed, ready to be placed in service as soon as production contracts are signed. Although this sounds simple, there are many difficulties to be overcome in practice.

No clean-cut switch can be made from temporary to normal procedure. Frequently it is necessary to start production by using temporary tooling. If the first production schedules are small there may not be much difficulty, but if quantity production is needed immediately considerable trouble is to be expected. Once these difficulties are overcome the production of parts becomes a routine matter until such time as increasing sales demand mass production, as in periods such as the present.

In order to initiate a mass production program such as that now being completed by the Wright Aeronautical Corporation, practically all of the manufacturing facilities of the plant must be increased and the service organizations of the plant must be reorganized. The procurement of machine tool equipment and the selection and training of new employees have been the major problems involved in this expansion program. The selection, purchase and installation of new manufacturing equipment usually can be solved without too much trouble, beyond that of delayed deliveries.

The lack of an adequate supply of skilled men is not so easily overcome. Not only must the present shop personnel be instructed in the operation and maintenance of the new machine tools, but a large number of new employees must be engaged and trained.

Prevent heat sickness!

BY C. D. LOOKER, PH. D., DIRECTOR OF RESEARCH, INTERNATIONAL SALT COMPANY

Hot weather needn't cause heat sickness, even on the warmest days. It can be prevented by taking salt tablets

ALTHOUGH INDUSTRY has devoted years to perfecting means for guarding employees against bodily injury, not until recently has well organized attention been directed toward preventing disorders due to industrial conditions. One of the most common of these is known as heat sickness, which increases fatigue and causes severe cramps.

Although employees who are not in the best physical condition are most susceptible to heat sickness, any worker may suffer an attack. This is especially true of the new worker on a hot job or of one who has changed to a more strenuous job. Attacks are also prevalent on hot, humid days following cool spells.

When employees perform manual labor under hot conditions their bodies perspire profusely. Instead of giving off about a quart of moisture, as on an average day, they may lose as much as six or eight quarts. Such perspiring increases the loss of salt which is essential to human life and health. Unless this salt is immediately replaced, unnecessary fatigue, exhaustion and heat cramps may follow.

Under ordinary conditions, the body usually obtains a sufficient supply of salt from its daily food. Since this minimum normal requirement amounts to at least 75 grains of salt a day, and 300 grains of mineral matter may be lost through perspiration in 24 hours, the necessity for promptly replenishing salt lost through such perspiration is evident. (An ordinary aspirin tablets weighs only 5 grains.)

Salt lost in perspiration is carried by the blood to the sweat glands and passed out through the pores of the skin, but the blood will not give up all of its salt in this way. It always maintains at least a minimum supply. When perspiration is profuse and continuous, the salt content of the blood soon reaches its lower limit and the fluid surrounding the tissues and the tissues themselves are called on to give up their salt. In this way depletion of salt by sweating may be serious if water is simultaneously consumed in amounts sufficient to dilute the remaining salt. This loss of minerals is the cause of heat cramps or muscle cramps, excessive fatigue, and upset stomach and intestines.

Experiments in the Panama Canal Zone, at Boulder Dam, and at Harvard Fatigue Laboratory, in addition to every-day practical custom in thousands of plants, have shown that a small amount of salt taken regularly with drinking water will present these conditions. Thus, salt in the form of compressed tablets is generally recommended with each drink of water and today is provided in many factories and offices. Five or six 10-grain tablets a day seem to be all required by any but the most profuse sweaters.

These tablets were originally provided as hard-pressed pills which dissolved slowly. They were blamed for causing nausea in some salt-sensitive workers, because they supposedly lie in one spot in the stomach and cause irritation. To overcome this objection, tablets are now produced which break up quickly when swallowed with water. The salt is then rapidly dissolved and absorbed, with little chance of causing nausea.

Experience has shown that no one is likely to take more salt than required for replacement, because normal reactions of each individual prevent excess absorption. "Unless a worker would, as an act of bravado," according to the Journal of the American Medical Association, "take a handful of salt tablets at one time, it is not known that any harmful results will arise from the use of salt tablets in industry, in the home or elsewhere."

Commenting on the replacement of salt in tablet form, Edward R. Granniss, formerly engineer of the National Safety Council and now Director of Industrial Safety, National Conservation Bureau, recently wrote:

"Results have been very satisfactory. Between the years 1920 and 1928, one investigator reported 171 patients suffering from heat in a single steel mill. During three years following 1928, when salt tablets were in general use, not a man was reported off duty because of heat cramps. There is considerable convincing evidence of the benefits derived through the use of salt tablets by persons exposed to high temperatures and the possibility of heat sickness. Salt tablets are inexpensive, and a few taken each day, depending on the temperature, the amount of perspiration, and the amount of water drunk, should produce a balanced physiological condition."

On a hot day a worker can lose 300 grains of salt through perspiration. Taking handy tablets to replace it keeps the body functioning properly

Fig. 1 — The die for making this part of 1/32-in. stock was laid out according to standard practice as shown in Fig. 2. Faults were revealed which would have resulted in too low an estimate of the cost for the forming job. The die was redesigned as shown in Fig. 3 on opposite page

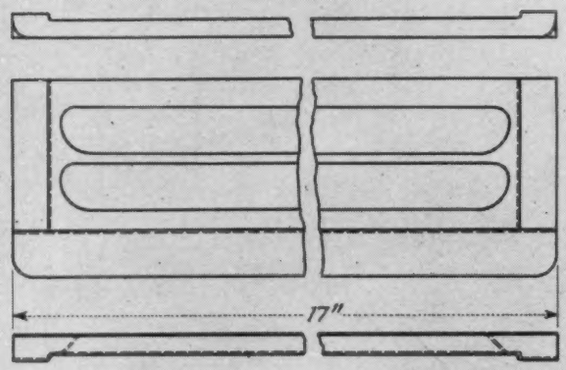
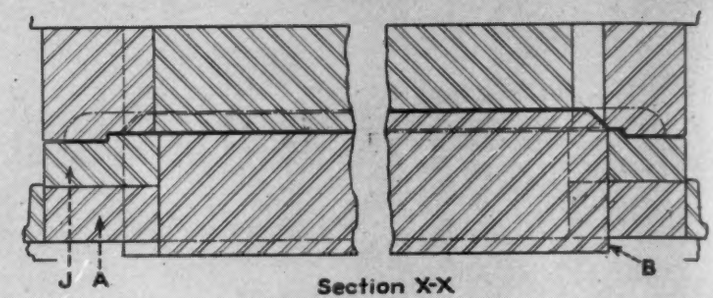


FIG. 1

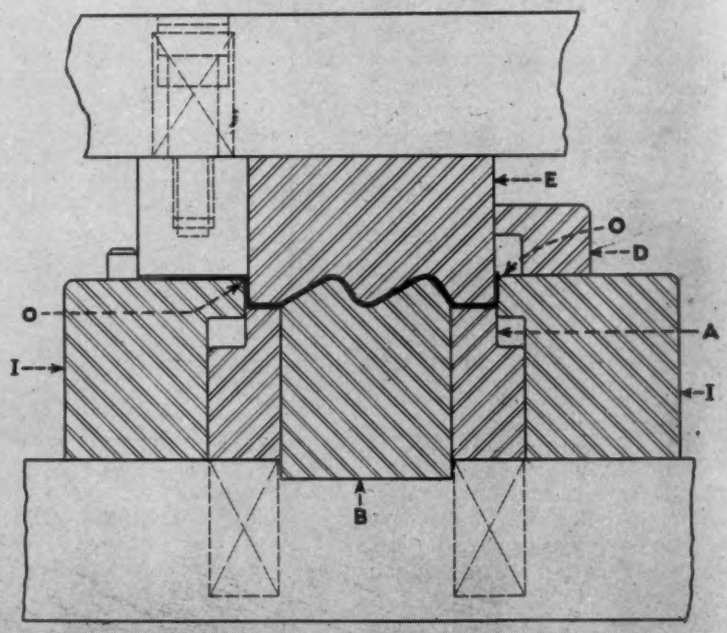
Fig. 2 — This forming die was the basis of the estimator's original price for the formed parts. If used, production difficulties and high manufacturing costs would have resulted

Fig. 3 — Before the final cost estimate was made, this die was worked out in detail. It is simpler, cheaper and more rugged than the one shown in Fig. 2 and was used with savings to the manufacturer and purchaser of the parts



Section X-X

FIG. 2a



Section Y-Y

FIG. 2b

The right and wrong of die

BY A. KEANE

Standard design of forming dies is not always best. Changes are often made to hold cost of formed parts to a minimum

MANY BLANKING and drawing dies have been analyzed, showing right and wrong designs. The converse is true of forming dies. This is unfortunate because estimators when determining production costs, are prone to base charges on standard die designs.

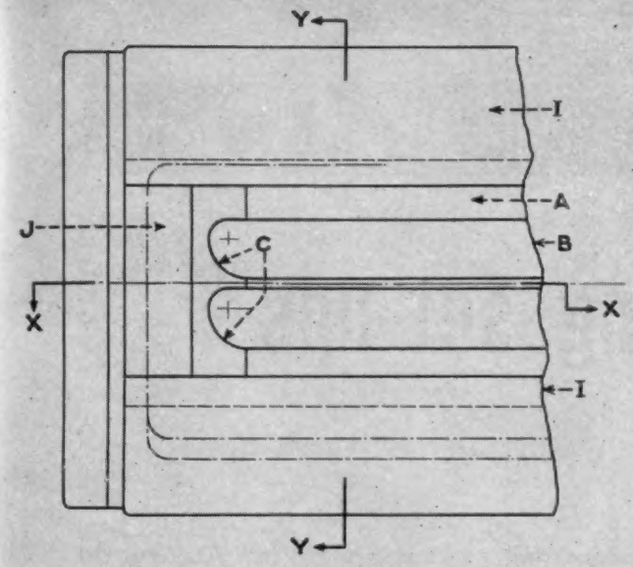
But it is not infrequent that a study of the forming dies reveals faults in design which can be corrected, making it possible to give the customer a better price on a job. Here's a case in point.

An estimator was asked to bid on the part shown in Fig. 1. Production was not considered to be any more difficult than the average run of die-forming jobs. Three operations were involved: (1) Cut-off and draw up the ribs, (2) pierce and blank, and (3) form the flanges and restrike two dies. Dies for the first two operations were built according to standard practice.

The forming and restriking dies for the third operation were also laid out according to standard practice, as shown in Fig. 2. But after the layout was completed it was observed that the action of the metal pounding on the narrow face of the pressure pad would expand it. The pad would then lock during operation. If hardened, it would break.

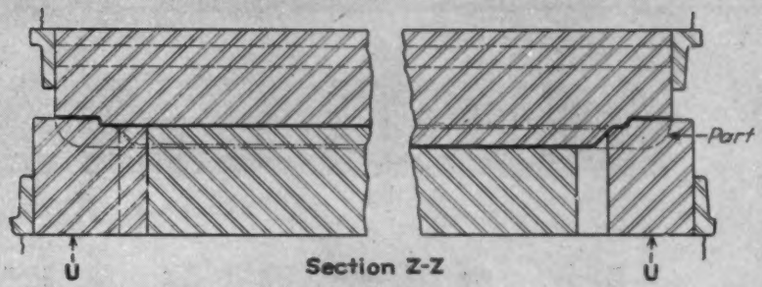
After some study, the layout shown in Figs. 3*a*, 3*b* and 3*c*, was adopted. The result was a simpler, cheaper and more rugged set of dies for the third operation.

Figs. 2*a*, 2*b* and 2*c*, show the third operation die as first laid out. The pressure pad *A* was not to be hardened, and was to be fitted around punch *B* as at *C*. The punch or restriking die *B* was to be machined for a working fit in pressure pad *A*, and



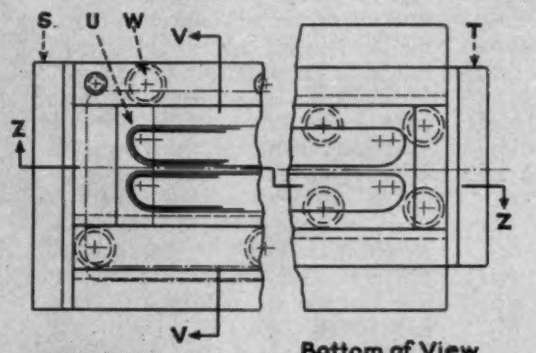
Top View of Die

FIG. 2c



Section Z-Z

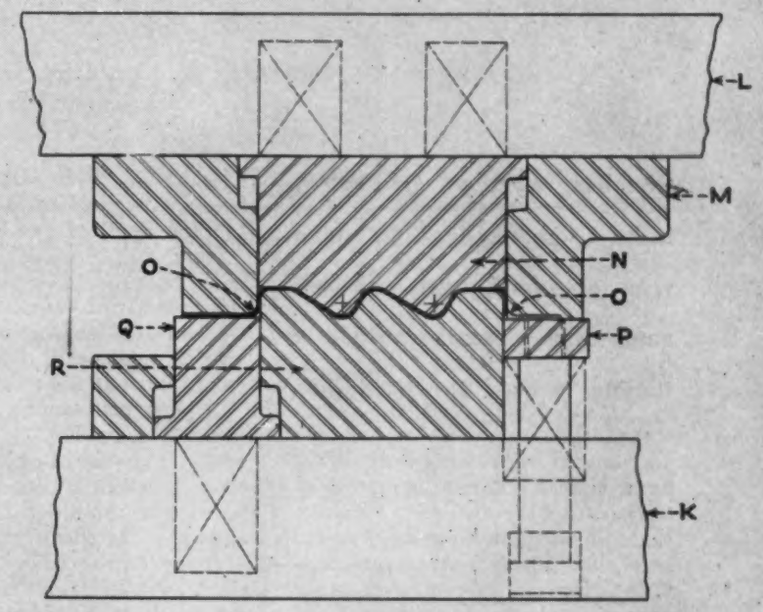
FIG. 3b



Top View of Die

Bottom of View of Punch

FIG. 3c



Section V-V

FIG. 3a

design

sunk into the die shoe to locate it, because it was not practical to ream dowel holes through the working face. Pieces *D* were mounted on the die to locate the part and help strip it off punch *E*. The tool-steel punches *I* were to form the flanges.

Two hardened tool-steel blocks *J* were to be used for forming the offset in the part, and were to be fitted to pressure pad *A* (see section *XX*).

If the estimator had based prices on this design, and he might have done so had not the production engineer observed its faults, the company would have been the loser. Consequently, the die was redesigned, as shown in Fig. 3, to the benefit of both the customer and the company.

As shown in Figs. 3*a*, 3*b* and 3*c*, the die was laid out upside down, when compared to Fig. 2. Parts *K* and *L* are standard die sets with two leader pins. Side-forming sections *M* run the full length of the part to be formed. The restriking punch *N*, which takes the place of pressure pad *A* and restriking punch *B* shown in Fig. 2*b* was made in one piece, resulting in a more rigid construction. It was made of nickel-iron, but Meehanite could have been used and for a time was considered. Pad *P* helps to strip the part. Forming punch *Q* also acts as a stripper. Restriking die *R* is practically the same as shown in Fig. 2*a*. Angle irons *S* and *T* were added to prevent parts *Q* and *R* from moving endwise. The adopted design made it quite easy to machine and fit the end blocks *U*. Die-block springs are shown at *W*.

Doubled bends which are in the formed part should never be more than 3 or 4 in. deep. Deeper bends have a tendency to mar the stock as it rolls around the corners *O*, especially on heavy stock. Corner radii should be four times stock thickness.

It has been frequently repeated that it is practically impossible to estimate the cost of a forming die or drawing die blank correctly. Whether this be true or not, a detailed layout of the die will aid in estimating costs, especially when the estimator, designer and production engineer collaborate on the problem. Many times a die maker may have on hand a die which approximates the one involved in the estimate. Such a die will save much time in making the estimate.

Typical chucking set-ups

BY J. R. LONGSTREET AND W. K. BAILEY, THE WARNER & SWASEY COMPANY

Chucking work on the turret lathe ordinarily can be done with standard tools without much change of set-up. Special tooling is used for hard jobs

THERE ARE A NUMBER of problems encountered in chucking work on the turret lathe which require careful attention from the operator. These include the accurate finishing of cored holes, interrupted reaming cuts, multiple facing and the proper set-up for producing bushings, sleeves and washers.

Ordinary drills frequently are used to enlarge cored holes. These tend to follow the eccentricity of the cored hole and produce run-out in the finished piece. This tendency can be reduced by using three-fluted core drills, but if the method shown in Fig. 71 is used the accuracy of the hole will be increased. In this layout the cored hole first is bored with a single point tool to a depth of $\frac{3}{8}$ to $\frac{1}{2}$ in. and then a square-end core drill is used. This bored hole should be the same diameter as the drill. The bored diameter will act as a guide bushing to prevent the square-end three-fluted drill from following the cored hole.

A permanent tooling set-up is used in the layout of Fig. 71. The drilling of (3) and rough turning of (6) are taken as multiple cuts, and are combined with the rough facing of (1) and (4). The chamfering of the hole and the finish turning of (6) are taken as multiple cuts combined with the finish facing of (1) and (4). The layout also shows the use of adjustable back stops in connection with standard jaws.

When a hole has an interrupted cut, such as diameter (3) in Fig. 72, the reamer must be held rigidly. This requires that it be held in perfect alignment with the spindle, regardless of inaccuracies of the shank of the reamer, the turret hole, or the tool holder. The part shown in Fig. 72 is a die casting. Tooling layout for machining this part is shown in Fig. 73. Because of the interruptions where the holes break into each other, the reamer for hole (3) is held rigidly in an adjustable tool holder. To align this tool holder, the first piece is bored accurately to size and the reamer inserted in the hole while the body of the tool holder is loose on its shank. This body then is clamped by the three bolts, the heads of which are shown in the diagram.

This die cast speedometer joint presents another problem, as it is necessary that hole (4) be aligned closely with holes (2) and (3). Holes (2) and (3) are bored before reaming and will be in accurate alignment, but hole (4) is drilled, and to assure concentricity with hole (3) the drill is guided by a bushing that is located in diameter (3).

The cutters for boring diameters (2) and (3) are held in quick-acting slide tools which, in this case, are adjusted to size and clamped in position for taking the boring cut. The quick-acting slide tool may be used for either boring or recessing and, if necessary, may be set to bore more than one size by inserting bar gages between the stop and the stop screw.

It is possible to make a standard set-up which will provide the proper method for machining almost any size or length of bushing, sleeve or washer provided, of course, that they are within the capacity of the machine. Such a set-up consisting of standard tooling is shown in Fig. 74. Adjustments for size and length can be made quickly with such a layout. The hexagon turret set-up consists of two slide tools for holding boring cutters or stub boring bars, and a reamer holder, to produce the hole.

The tools on the universal cross slide are used for turning and facing.

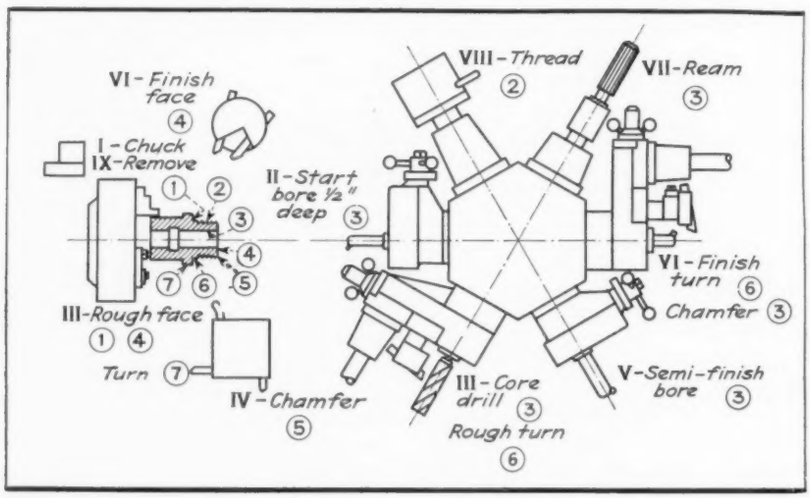

VI - Finish face 4
I - Chuck
IX - Remove
1 2 3 4 7 6 5
II - Start bore ½" deep 3
III - Rough face 1 4
Turn 7
IV - Chamfer 5
VIII - Thread 2
VII - Ream 3
VI - Finish turn 6
Chamfer 3
V - Semi-finish bore 3
III - Core drill 3
Rough turn 6

Fig. 71—In this tooling layout for a threaded guide sleeve the cored hole is bored with a single-point tool to a depth of about ½ in. before using a standard three-flute drill

Additional turret faces are available if they are needed in such a layout. Where washers are to be made, usually a long casting is held in chuck jaws and the casting is bored and turned as if it were a bushing. Then the rings or washers are cut off one by one. Some bushings require two chuckings, others can be completed in a single chucking by cutting off the completed bushing from a chucking extension cast in place on the rough part.

The boring bars shown in the layout of Fig. 74 are held in slide tools and, therefore, can be adjusted quickly to size. The turning cutters which are held on the cross slide also can be set to size quickly so that the set-up time, to change from one size or type of bushing to another, is reduced to a minimum.

Jobs having long facing cuts, such as the cast iron clutch disk shown in Fig. 75, should have the roughing cuts taken by two or more cutters operating at the same time. Saddle type machines having an open type square turret on the cross slide easily can be equipped with two facing cutters as Fig. 76. On ram type machines, a two-cutter rear facing block can be used for the same work. As the cut is started, the cutter nearest the center of the piece is fed into the middle of the face to the proper depth, and then the power cross feed is applied and the two cutters move across the face, one starting at the outside diameter and the other starting in the middle of the surface. By doing this, the facing cutter on this particular piece is only $2\frac{3}{8}$ in. in length, instead of $4\frac{3}{4}$ in. The finishing cut is taken with a single cutter in order to give a perfectly smooth surface without any overlapping joints. This tooling set-up, also shows how the stub boring bar cutter head can be used to hold cutters to chamfer the bore after the boring cut has been finished.

When a large amount of metal has to be removed under heavy cuts from the hexagon turret, it may be necessary to use both external and internal piloting. The rotary guide sleeve, Fig. 77, is made from a nickel steel hand forging and comes to the turret lathe rough forged. Between $\frac{1}{4}$ and $\frac{3}{8}$ in. stock has to be removed on a side. The boring of the large hole (10), the turning of diameters (2) and (3), combined with the rough facing of (1) and (4) from the square turret require up to 15 hp. when operating at 85 ft. per min. with a 0.032 in. feed.

The recommended tooling method,

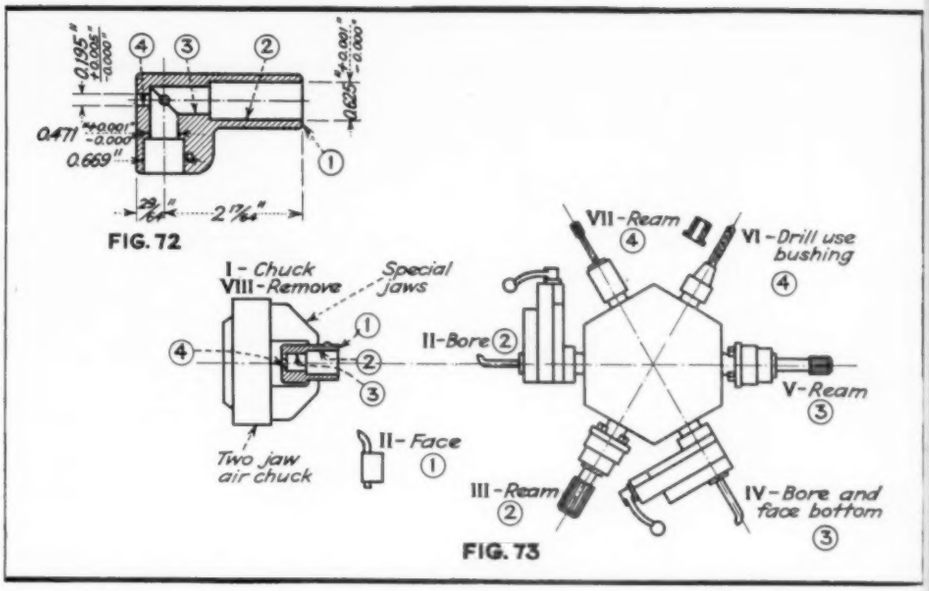


Fig. 72—This die-cast speedometer joint requires careful tooling because of the interrupted cut in the hole. Fig. 73—Adjustable tool holders are used to hold the reamers in this tooling set up for the speedometer joint

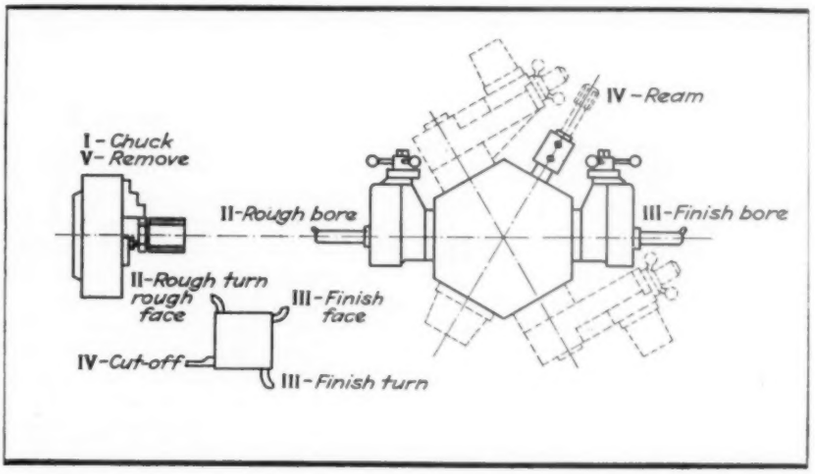
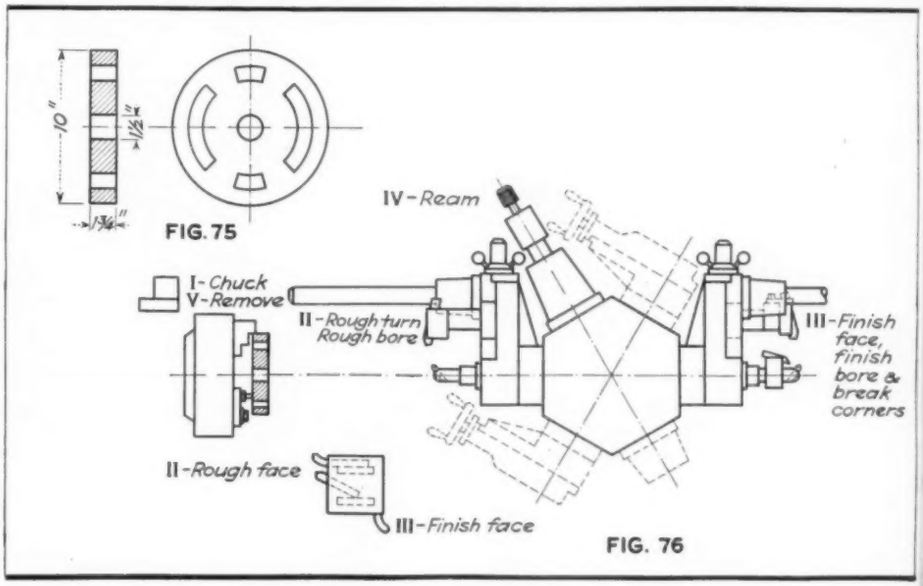


Fig. 74—This tooling set up includes boring bars and turning cutters which can be adjusted to size quickly for finishing bushings, sleeves or washers from cored castings

Fig. 75—Two cutters operating simultaneously are used for rough facing this cast-iron clutch disk. Fig. 76—On saddle-type machines two facing cutters can be mounted in the open-type square turret



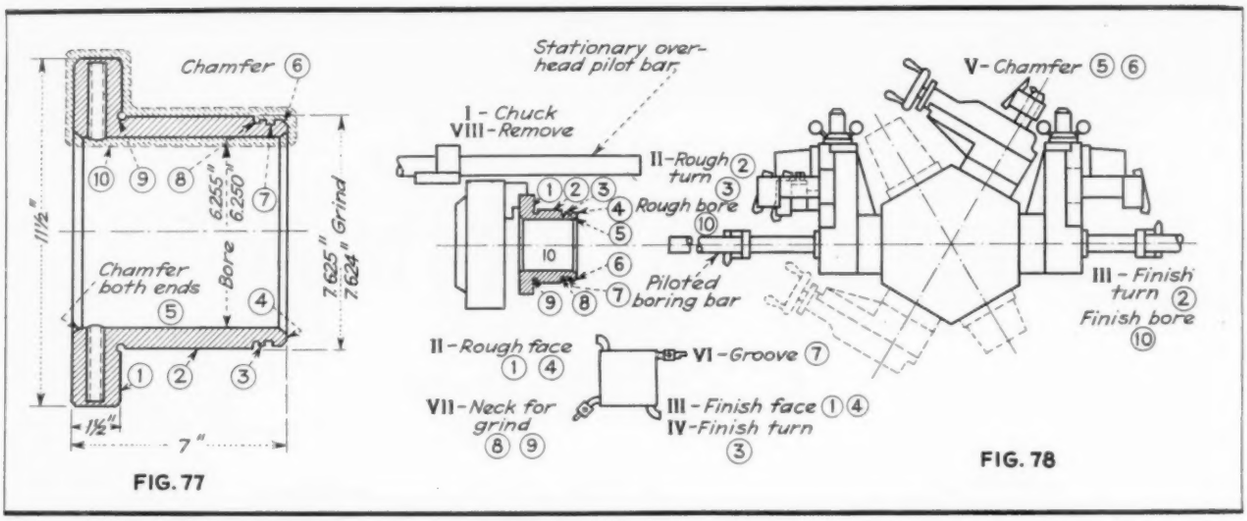


Fig. 77—Internal and external piloting are necessary when machining this hand forged rotary guide sleeve. Fig. 78—The center pilot in this layout prevents the boring cutter from being forced out of line; the overhead pilot absorbs strains imposed by turning cuts

Fig. 78, shows both overhead and center piloting being used. The overhead pilot absorbs the heavy twisting and turning strain of the turning tools in the adjustable single turning head. The center pilot prevents the boring cutter from being forced out of line and increases its rigidity, allowing heavy feed.

Even on lighter work, it should be remembered while the overhead pilot bar strengthens the turret, the pilot on the boring bar provides additional support for the boring cutter. A bar supported on both ends is always more rigid than a stub bar, no matter how large or small it may be.

In recent years the amount of heavy bar work (over 4½ in. in diameter) has increased greatly and, because most heavy bar work includes the machining of large diameter holes, this class of work is handled with chucking tools. Ordinarily, it is turned, faced and formed from the square turret; and drilled, bored and reamed from the hexagon turret.

Heavy bars are held by means of a standard three-jaw geared scroll chuck to which a bar chuck plate has been attached. Such an arrangement is shown in the tooling layout on Fig. 80. The combined grip of the chuck jaws and the three set screws in the bar chuck plate provides a sufficient length between the gripping point to assure rigid holding.

These heavy bars are fed through the spindle and are supported at the end by the usual bar feed arrangement. However, when the bars become so short that the rear end is inside the spindle, the auxiliary stock feeding device shown in Fig. 81 is used. This device feeds the bar through the spindle and supports and centers the rear end of the bar.

When only an occasional heavy bar job is run, and there is no bar feeding mechanism or stock feeding device available, the bar can be supported by means of a large collar and spider as shown in Fig. 82. The large collar supports the bar when it extends out through the spindle, and the spider supports the bar when its rear end gets inside the spindle. The large

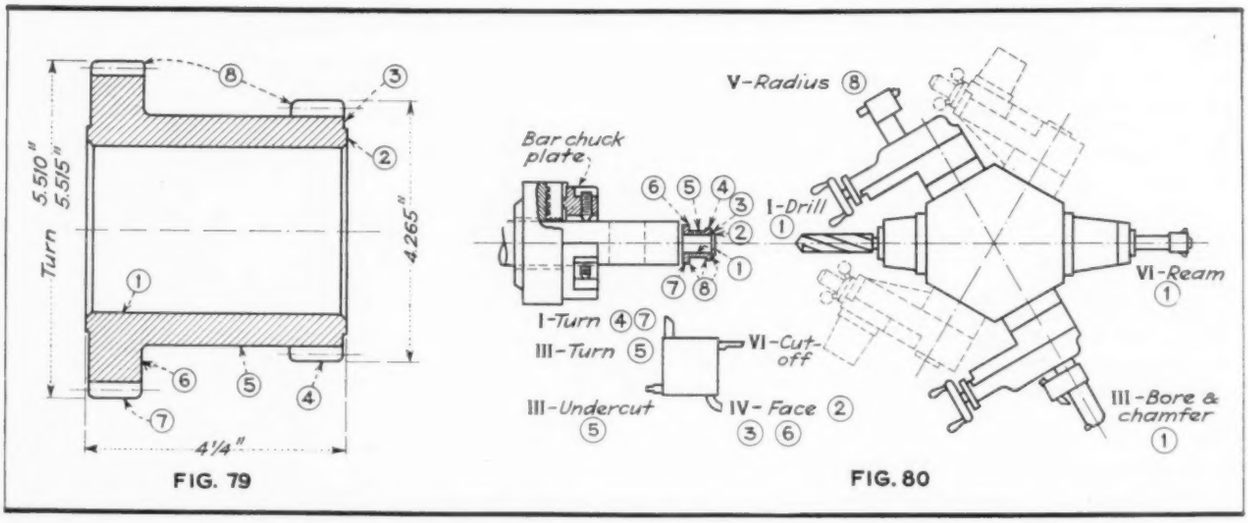


Fig. 79—Parts turned from large-diameter bar stock ordinarily aremachined with chucking equipment. This double gear is an example of such work. Fig. 80—When length of part is less than stock diameter, the bar is fed out far enough so that several pieces can be made

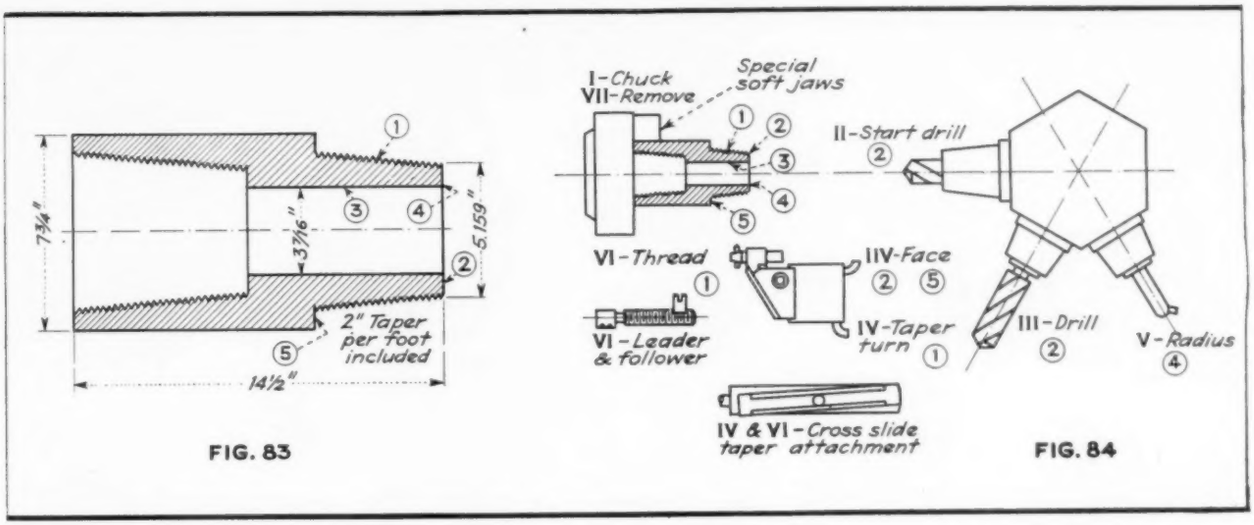


Fig. 83—Large taper threaded work like this steel tool joint best can be handled with a standard threading tool holder. Fig. 84—A leader and follower threading attachment is used, when the lathe is not equipped with an independent lead screw, for taper threading operation

collar, which is screwed and clamped to the spindle, grips the bar by means of four set screws. The spider is fastened to the bar as a preliminary operation.

A typical tooling set-up for a heavy bar job, such as the double gear blank in Fig. 79, is shown in Fig. 80. When the length of the parts is shorter than the diameter of the stock, as it is with this example, the bar is fed out far enough so that a number of pieces can be made before it is necessary to feed the bar again. When the part is longer than the diameter of the stock it usually is fed out only far enough to make one piece instead of two or more at one setting.

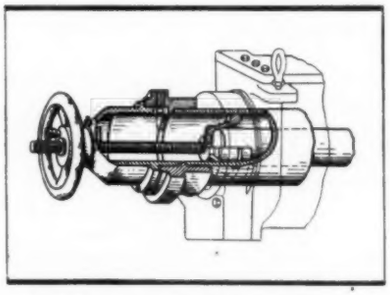


Fig. 81—An auxiliary stock feeding device is used when heavy bars become so short that the rear end is inside the spindle

The forged steel tool joint shown in Fig. 83, is typical of large taper threaded work, produced on turret lathes. The method of handling the pin end, having the external thread is shown in the layout of Fig. 84. This set-up shows that a leader and follower threading attachment is used in connection with the cross slide taper attachment for producing the taper thread (1). It would, of course, be practical to use the independent lead screw if the machine was so equipped, but for relatively short threads and when only one pitch is to be cut, the leader and follower arrangement is quite satisfactory in most cases.

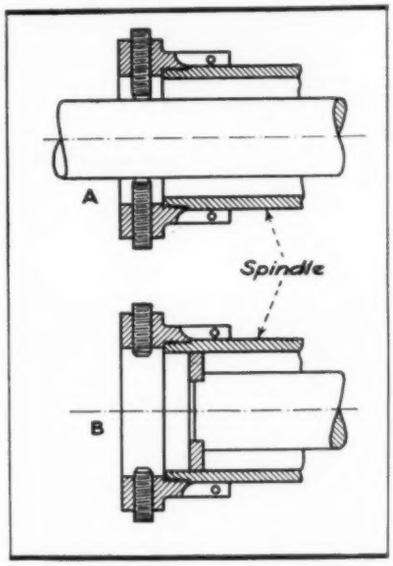


Fig. 82—A large collar with setscrews sometimes is used as at A *to support large bars which extend through the spindle. When the bar is short a spider,* B, *is used*

The single-point threading cutter is held in a standard threading tool holder which is mounted on the square turret. This tool holder provides an angular feed so that the cutter can be advanced on an angle equal to the angle of one side of the thread. While a thread is being roughed out, the cutter is advanced for each pass by means of this tool. For the final finishing cut, the entire cross slide is moved forward, and both sides of the thread are finished at the same time with the single-point tool.

From a forthcoming book on turret lathe operation.

Gearless Motor Car

A SENSATION was caused by the demonstration of a gearless and clutchless motor-car at the annual gathering of the British Association. According to *Industrial Britain*, the basic idea is that of transmitting power through a turbine driven by fluid from a centrifugal pump. The turbine is direct-connected to the rear axle.

It is said that the apparatus which is the work of Commendatore Piero Salerni, relieves the transmission system of shock loads and thus reduces maintenance costs. A car carrying this apparatus has been tested for 65,000 miles and shows very few signs of wear either in the mechanism or the tires. Commendatore Serni said that cost of his invention on a mass production basis would compare favorably with cars embodying existing transmission systems.

4,000 die castings daily

Flash along the outside parting is sheared in a light arbor press equipped with a hydraulic ram. The part is an automobile engine fuel pump bracket

A special machine performs one facing and two counterboring operations

Can only four men finish 4,000 complicated die castings in one day? Yes—with proper tooling

GOOD TOOLING is required for four men to trim, drill, face and counterbore 4,000 die castings a day, even though the cuts are all light ones. And when the part is not of the simplest type and is required with dimensions held rather close, the tooling must be carefully engineered. Long experience on similar jobs has enabled Stewart Die Casting Division of Stewart-Warner Corporation to turn out accurate fuel pump brackets with high efficiency.

Made of high-purity zinc alloy, the casting consists of an outer tube with two flanges at right angles. Inside this tube is an integral smaller tube with an elbow. Shape of the casting is such that an irregular parting line is required, and cores must be pulled from both ends. Hence, several fins have to be sheared where cores come together.

In this first operation, a light arbor press equipped with a hydraulic ram and trimming tools is used to shear

Another special machine shears flash from the integrally cast inside tube

Three final facing operations on a hand milling machine complete the part

flash along the outside parting. Next, the piece is passed to a special machine fitted with a Kingsbury head having the spindle vertical above the work. A milling cutter on another vertical spindle is located below the work. As the piece is held in a pneumatic chuck with the end flange downward, the lower milling cutter rises and machines a counterbore in the flange and one in the center tube. At the same time, the Kingsbury head lowers and faces the top edge of the tube with an end mill. While this cycle is proceeding, the operator sets up another casting in a light hydraulic press at his left. When the ram is tripped, a shaped tool shears flash from the interior of the outer tube, and a pair of punches on the same holder shears flash from the flange bolt holes. Another flash-trimming operation is performed in a light hydraulic press which cuts flash from the outside of the central tube.

An air chuck holds the part on the table of a hand milling machine for the next operation. This machine has a vertical and a horizontal spindle, each equipped with a cutter having inserted blades with carbide tips. As the table is traversed, these cutters face the two flanges, making them truly square. One of the cutters also faces the end of the inner tube, which is then flush with the flange.

There are some other minor operations for removing flash and burrs, certain of them performed with hand tools at a bench by the fourth man.

Easy Handling

BY ED WEST

NOW-A-DAYS you hear a lot of talk about making work pleasant and easing the job for the worker. The trouble is that many bosses think it takes big chunks of money to do this.

The other day, we were in a place that didn't seem to think so. In addition to the usual tricks of putting in overhead hoists to do the lifting and putting up home-made trolley systems, this shop went one step further. Some old drill presses were being used to drill miscellaneous holes in fairly large castings. While the overhead system was convenient for getting the heavy castings on the table, they still had to be horsed around to get the various holes in position under the drill.

The shop foreman licked this job by bolting two angles to the drill table parallel to each other and about eighteen in. apart. Holes were drilled in each angle to support the bearing ends of rollers placed at regular intervals perpendicular to the angles. This eased the job of moving the castings underneath the drill, stepped up production at the cost of only a few inexpensive scrap parts, and the last time we saw the operator he said he'd gained five pounds.

IDEAS FROM PRACTICAL MEN

Discussion of Tap Sharpening Fixtures

By MARTIN H. BALL

Fig. 1 shows a fixture for grinding taps with the grinding wheel revolving in the usual direction—that is with the cutting face driving downward—so that the grinding of the tap would be over its cutting edge instead of against it. That condition, described by H. M. Darling (*AM*—Vol. 83, page 827), could be improved by reversing the slope on the working side of the cam and placing the fixture at the left of the grinding wheel instead of at the right, as shown. Mr. Darling's fixture is for sharpening machine screw taps having no countersunk centers.

Fig. 2 shows a fixture for sharpening the tapered ends of larger taps having countersunk centers at both ends. By the use of this fixture, the lands are given eccentric relief, which provides for the greatest support at the cutting edges, due to the fact that the minimum radial relief that can be used consistent with the material to be tapped is easily produced, and with the clearance increasing with the distance from the cutting edges, thus leaving a convex surface.

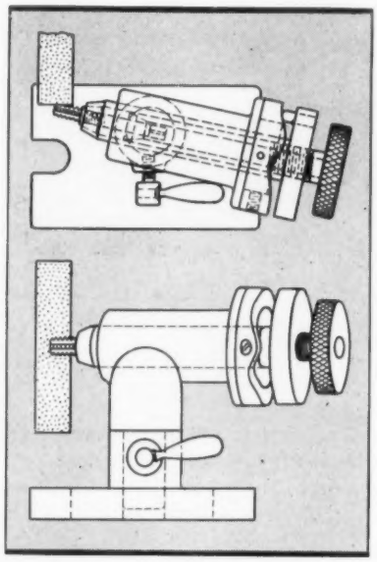


Fig. 1—Taps held in this fixture mounted on the table of a grinder will have their front cutting edges sharpened and a uniform relief ground on lands

Essentially, the fixture consists of the rectangular cold-rolled steel bar *A*, one end of which is bent at a right angle and carries the center *B* and the locknut *C;* the bracket *D* carrying the post *F* and the index finger *H;* the adjustable head *I;* the adjusting center *K;* and the necessary clamping screws. Both centers are threaded and have countersinks in their outer ends, the one in center *B* being offset $\frac{3}{32}$ in. The bent end of the bar has a zero mark, in line with which any desired setting marks for locating the offset countersink in center *B* may be made on the plain face of the locknut. Such setting marks will vary somewhat for suitable clearances for tapping different metals, and also for taps of different diameters.

In use, the fixture is held between centers of any type with which the grinder to be used is equipped, the centers engaging the countersinks in the outer ends of centers *B* and *K*, and is set to the correct angle in relation to the grinding wheel for the required taper. Center *B* is turned to bring its offset countersink in position for the relief required. The tap is then mounted between centers *B* and *K* and center *K* is screwed up to hold it securely and is locked by the clamping screw. The indexing finger is adjusted by moving its bracket on the bar to a position where it will not interfere with the grinding wheel. With the face of one of the flutes in contact with the indexing finger, the table is moved by the longitudinal feed screw to bring the tap into grinding position. With one land in contact with the grinding wheel, the fixture is oscillated by hand and the tap is gradually fed to the grinding wheel. After the first land has been sharpened, the table stop is set for the final depth of cut. The table is then moved to bring the tap clear of the grinding wheel and the tap is indexed to bring the face of the next flute into contact with the indexing finger and the table is moved to bring the land into grinding position, when grinding proceeds as before. The operations are repeated until all the lands have been sharpened.

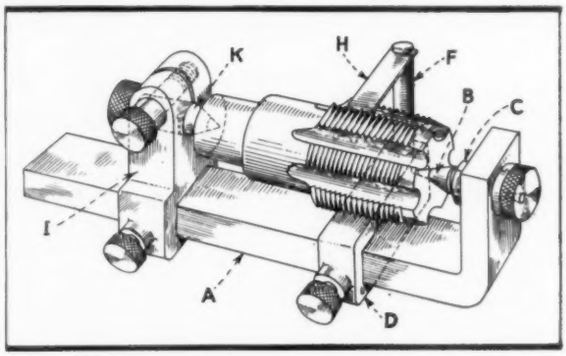


Fig. 2—The supporting centers of this fixture are offset so that when sharpening the lands at the cutting end of the tap they are automatically given the necessary eccentric relief at this point

Making Small Taps Stronger

By ARTHUR SILVESTER

Mr. Charles Homewood has suggested that flutes of small taps be milled on a taper with the tap axis, so that the portion of the flutes next to the shank will be only slightly deeper than the full depth of the threads. (*AM*—Vol. 84, page 60). Mr. Homewood believes that this will equalize the strength of the flutes along the full length of the threaded portion, thereby mak-

ing them stronger at the danger point of breakage. I do not believe that Mr. Homewood's suggestion will increase the strength of the flutes.

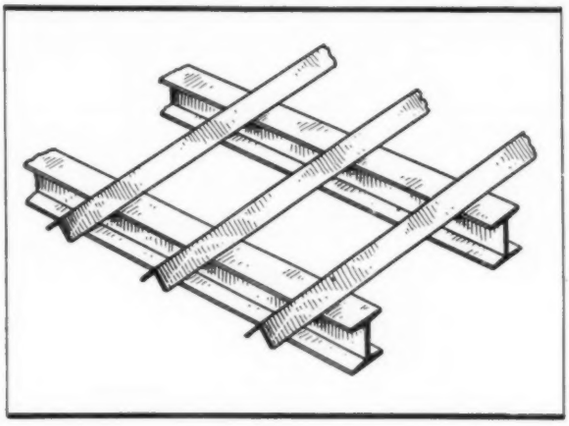
Parallel flutes on taps were made standard after considerable experimental work. Investigation disclosed that in the majority of cases, small taps broke near the last four or five threads, and not at the point where the grooves end and the shank begins, even though the latter is the point where the greatest strain occurs when the tap is fully inserted.

A skilled mechanic will often break a tap or two on a single hole before he gains the knack of instinctively feeling what pressure to apply. In plants where tapping of small holes by hand is an everyday production job, the ease and speed with which the work is done is astonishing, and the top breakage is surprisingly small.

Adjustable Support for Stacks of Steel Plates

By F. SIDNEY

Ever since the introduction of pantographic flame-cutting steel plates in stacks it has been general practice to support the stacks directly on I-beams. W. J. Tangerman's supports undoubtedly prevent the flame from cutting into the flanges of the I-beam as it passes through the bottom plate of the stack (*AM*—Vol. 83, p. 1087). Rather than use supports made of round stock welded to flat plates bent to fit around the I-beam flanges, as described by Mr. Tangerman, we find that angle irons laid transversely across the I-beams as shown in the illustration serve as satisfactory supports for the plates and prevent cutting the I-beam flanges.



Angle irons laid transversely across I-beams make excellent supports when flame-cutting stacks of steel plates. The sloping legs of the angle disperse the flame, the speed of which is usually sufficient to pass over the point of the angle without damaging it. The angles last for a long time

The legs of the angle so placed disperse the cutting efforts of the flame. Ordinarily, the speed of the cutting torch is sufficient to pass over the points of the angles without damaging them. We get reasonable use from angles set in this manner.

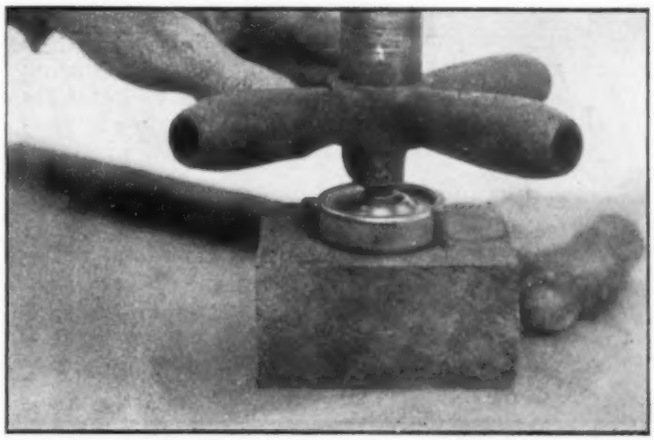
Ample support is afforded by the angles for small as well as large jobs. The angles can be located quickly to accommodate all sizes of plates to be flame cut.

Skate-Wheel Center for Air-Motor Feed Screws

By FRANK BENTLEY

The feed-screw center of an air motor is held as a rule by driving a heavy center punch mark into an odd piece of sheet iron and setting this on blocking to provide distance for feeding out the screw. The center frequently jumps out of the punch mark, and the plate itself is none too safe for convenience in many instances.

A roller skate wheel can be used for this purpose. The race serves as an excellent central pocket for the feed-screw point. The wheel can be secured to blocking by several nails as shown in the illustration. When the block is moved to adjust the alignment of the drill, the drill center will not slip. The wheel race will turn easily with the feed screw when moving the handle to feed the drill.



A roller skate wheel is a practical and convenient bearing for feed-screw centers of small portable air motors. When feeding the drill center will not slip

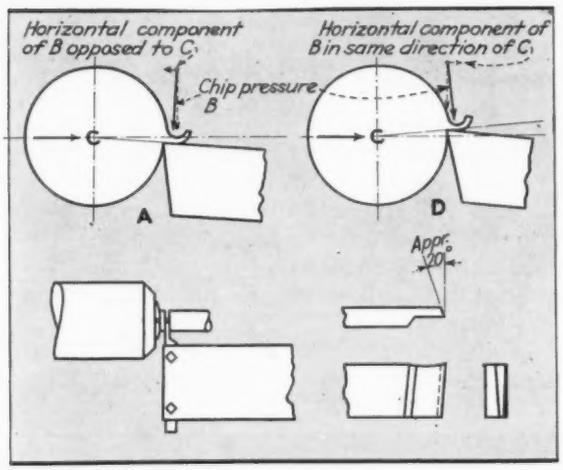
Parting Tool Design

By EMIL WITTMANN

C. G. Williams has described a method of grinding and setting a parting tool so as to get the chip out of the scarf in the easiest possible manner (*AM*—Vol. 83, page 1088). But if the tool is set below the center line of the work, as Mr. Williams suggests and is shown at *A* in the accompanying sketch, the horizontal component of the chip pressure *B* in the opposite direction to the horizontal pressure *C* of the work against the tool in combination with any play of the

spindle in its bearings or looseness of the cross-slide caused by wear will invite chatter.

If, however, the tool is set slightly above the center line of the work, as at *D*, the horizontal component of the chip pressure *B* will be in the same direction



If the nose of the parting tool is ground at an angle of approximately 20 deg., it will curl the chip sidewise and prevent binding in the scarf

as the horizontal pressure *C* of the work against the tool and there will be no tendency to chatter.

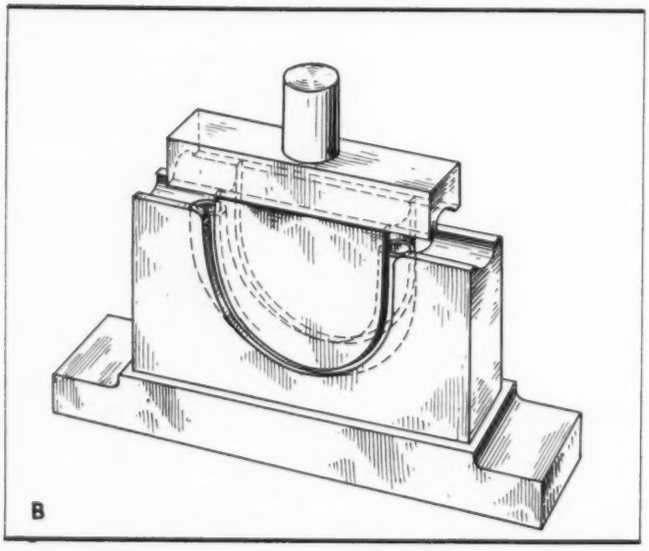
If the nose of the tool is ground at an angle of approximately 20 deg., it will curl the chip sidewise and prevent it from binding in the scarf. Also there will be no tit left on the piece cut off, as would be the case if a square-nosed tool were used.

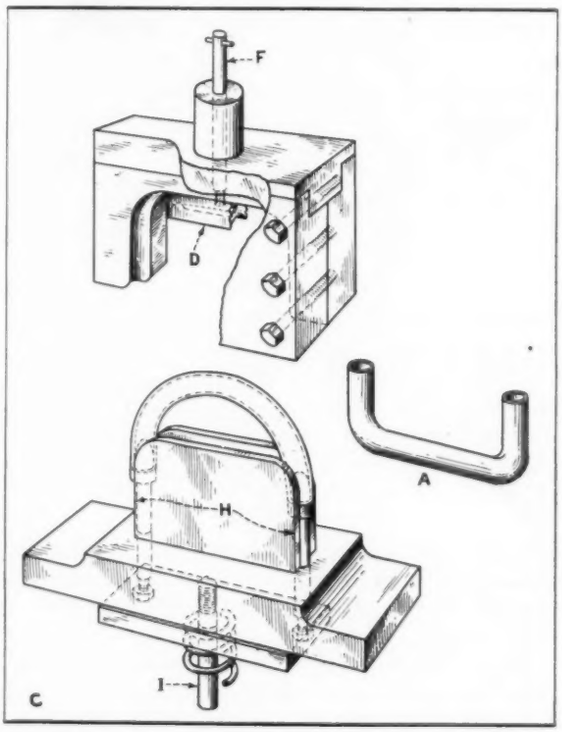
How To Bend Tubing Without Distortion

By JOSEF N. PETERSON

After several fruitless attempts to bend tubing into the U-shape shown at *A* in one operation without flattening at the bends, we made the press tools illustrated for doing the work in two operations. The first operation was performed in the tools shown at *B*, in which the tubing was bent to a semicircle, the radius being equal to the distance between the legs of the finished work. Both the punch and the die were grooved to fit the outside diameter of the tubing. This one large bend did not flatten the tubing to any noticeable extent and any slight flattening was distributed over its entire length.

The tools for the second operation are shown at *C*, the die being inverted to facilitate loading and unloading. The die proper is simply two slabs of soft steel grooved to fit the outside diameter of the tubing, half in each, and shaped to form the semicircular bend into U-shape. The parts were casehardened, bolted together and attached to the punch holder. The knockout *D* is connected by the rod *F* to the knockout bar of the press. The punch stands upright in the die-shoe and is simply a piece of tool steel machined to the required U-shape, grooved to fit the outside diameter of the tubing and hardened. The two pins *H* have enlarged heads tapering off to points and are connected to the spring buffer *I* by a piece of flat steel. They serve to locate the ends of the tubing before final bending begins and also to strip the work from the punch should it stick thereto after bending. In forming the tubing into U-shape from the semicircular bend it was uniformly round at the bends.





By bending the tubing in two operations in the tools illustrated, it was formed to the required U-shape without being flattened or otherwise distorted at the bends. The punch and die for forming the U-bend in the second operation are inverted for easy loading and unloading

AMERICAN MACHINIST REFERENCE BOOK SHEET

Weight of Bar Stock—III

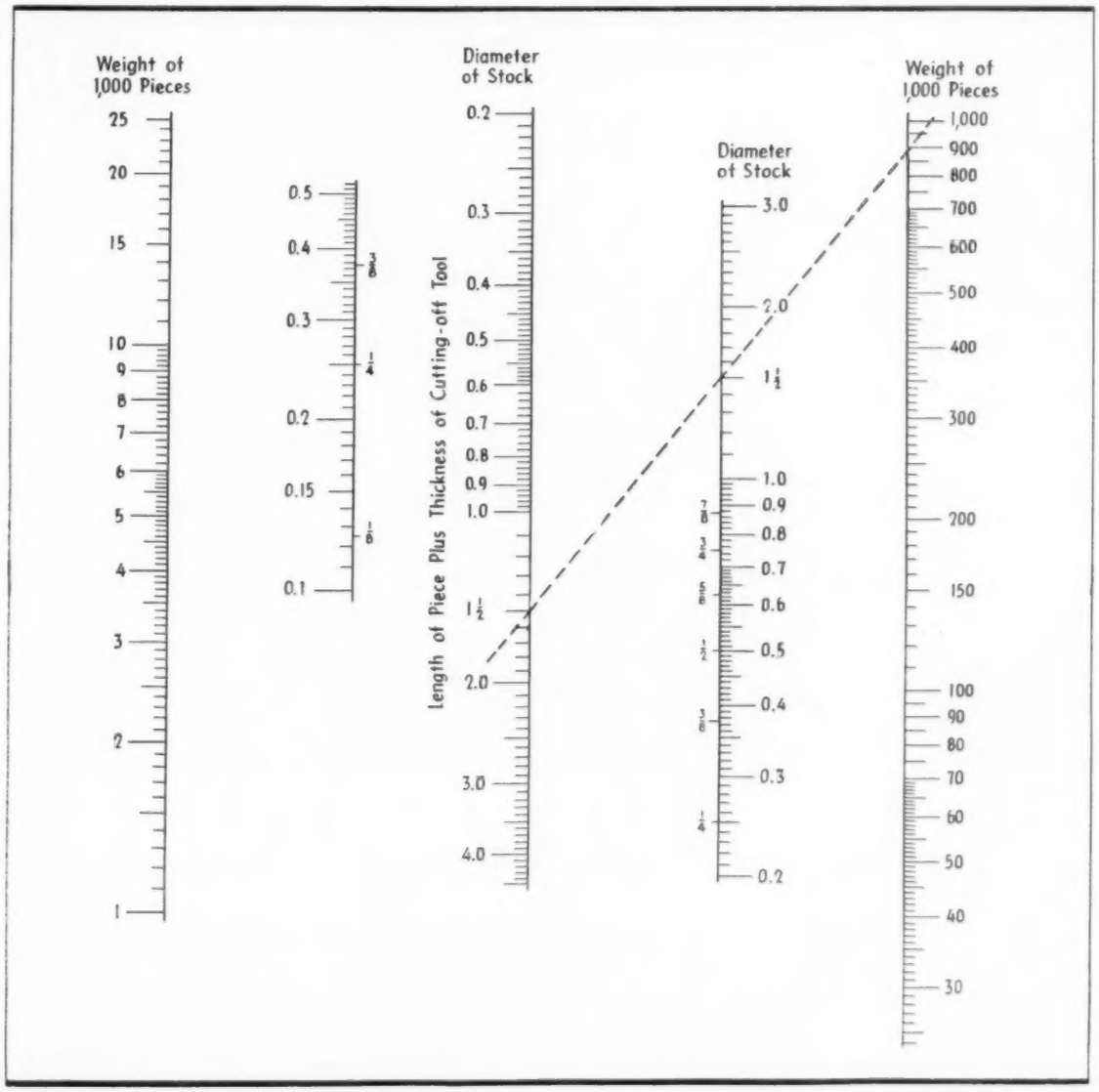
BY LOUIS deL. BERG

Hexagonal Brass

THIS CHART is used to determine the weight of hexagonal brass stock for 1,000 pieces of known length and diameter within a range of approximately 0.10 in. diameter by 0.20 in. long to $1\frac{1}{2}$ in. diameter to 4 in. long. There are two diameter scales and two weight scales on the chart. Care must be taken that the weight scale is always read on the same side as the diameter scale used. Charts for the weight of round steel, hexagonal steel, and round brass stock were published in a previous issue (*AM*—Vol. 84, pages 341 and 342).

DIRECTIONS—Ascertain the diameter of the stock to be machined and the length of the finished piece; add to the latter the width of the parting tool. Using this diameter and length, draw a line through the diameter and length scales until it intersects the weight scale. The reading on the latter will give the weight of hexagonal brass stock necessary to machine 1,000 pieces.

EXAMPLE—The weight of stock required for 1,000 pieces $1\frac{7}{16}$ in. long (add $\frac{1}{16}$ in. for width of parting tool) made from $1\frac{1}{2}$ in. hexagonal brass is 880 lb.



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NEW DEPARTURE

THE FORGED STEEL BEARING

Selection of Die-Casting Alloys

By WILLIAM T. SAVAGE, JR.

SELECTION of the proper alloy for die casting may be governed by first cost, but cost may become a secondary factor when certain physical characteristics are desired. The table, given as an aid to preliminary choice for die-casting alloys, is based on standard A.S.T.M. alloys and specifications. It does not follow that the castings themselves will have the same physical properties, but the relative guidance furnished by the table will be of some help in making preliminary studies. No attempt has been made to include all alloys that can be die cast; only representative and more widely used materials are included.

Zinc alloys, because of their low cost per casting, ease in casting and good properties have attained wide use. Aluminum alloys weigh less, but cost considerably more per casting. Magnesium is excellent where weight is an important consideration, but requires a special die-casting technique and its cost is high.

Aluminum and brass are good electrical and thermal conductors; hence, they are useful for current-carrying parts and for enclosures for parts where arcing might occur. Under such conditions zinc would not be satisfactory. Aluminum alloys are usable for temperatures up to 700 F.; this condition would rule out a choice of either zinc or magnesium.

PROPERTIES AND CHARACTERISTICS OF DIE-CASTING ALLOYS

Composition and Properties

Die-casting alloy	*Approximate percentages of principal alloys*	*Tensile strength, lb. per sq. in.*	*Elongation in 2 in., %*	*Brinell hardness*	*Specific gravity*	*Order of dimensional accuracy as cast*
Zinc	Cu 2.50–3.50; Al 3.50–4.50; Mg 0.02–0.10	44,000	2.0	80	6.70	1
Zinc	Cu 0.10; Al 3.50–4.30; Mg 0.03–0.08	35,000	3.0	75	6.60	1
Zinc	Cu 0.75–1.25; Al 3.35–4.30; Mg 0.02–0.08	40,000	2.0	75	6.60	1
Aluminum	Si 12.0	33,000	1.5	80	2.66	2
Aluminum	Si 5.0; Cu 4.0	32,000	2.0	70	2.78	2
Aluminum	Si 2.0; Cu 7.0	34,000	1.5	70	2.85	2
Brass	Pb 1.0–3.0; Zn 30.0–35.0; Sn 0.0–1.0	40,000	20.0	60	8.50	4
Magnesium	Al 9.0–11.; Mn 0.10; Zn 0.30	33,000	2.0	62	1.80	3
Magnesium	Al 8.3–9.0; Mn 0.13; Zn 0.40–1.00	33,000	3.0	60	1.81	3

Characteristics

Type	*Zinc*	*Aluminum*	*Brass*	*Magnesium*
Cast surface, neglecting die factors	Very smooth; only light buffing required in some cases.	Smooth—in some cases as good a surface as that produced with zinc.	Somewhat rough due to higher casting temperatures.	Smooth—in some cases as good a surface as produced with zinc.
Ease of finishing	Easily plated; done automatically in large quantities. Can be polished but surface must be protected by lacquer. Organic finishes are suitable, but finishes that require baking above 250° F. should not be used.	Difficult to plate, but can be buffed to a high polish which does not tarnish easily. Can be anodically coated. Organic finishes, air dried or baked, are suitable.	Easily plated; organic finishes or bake-dried are suitable.	Plating has only been done experimentally. Suitable for all kinds of organic finishes.
Corrosion resistance	Parts subjected to moisture will corrode unless treated chemically. Not recommended for use in acids or steam. Attacked by acids and strong alkalies.	Good corrosion resistance and suitable for use in parts contacting food. Anodic coating improves corrosion resistance of these alloys.	Highly resistant, but will be attacked by acids.	Will tarnish under humid conditions. They should be treated chemically or coated with organic finishes.

TRICKY JOBS CALL FOR TRICKY IDEAS

How would you tap a deep through hole in tough forged steel parts like these — speed being a major factor?

This is the way a G. T. D. Greenfield Engineer did it. A special high speed steel tapper tap to save "backing out" time—a pilot point for accuracy, a short thread to reduce resistance, two flutes for a strong cross section able to stand the high speed and torque.

Result — no more worries on this job — where incidentally, accuracy is checked by the G. T. D. Greenfield thread gage shown in the picture. See why it is so often good business to call in a G. T. D. Greenfield Engineer?

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For the Record

WAR has suddenly thrust the machine tool industry into the spotlight. The Allies need machine tools by the hundreds. So do the aircraft people and others tied in with national defense. It is a key industry.

The press and the public are interested. Special writers, who jump from one general subject to another with the agility of a trapeze performer, are discussing at length this newly-discovered industry which has operated unnoticed for more than one hundred years.

Writers, careless of their facts, are referring to the industry as a "bonanza business." How easy to give the impression that here is an industry tied to the kite of Mars, an industry which limps along anemically in between wars and blossoms into full vigor when a first-class conflict starts!

Let's be charitable and say that these views are not arrived at through malice. They are the outcome of fuzzy thinking. They indicate a profound ignorance of the machine tool industry.

In the interests of fair play, and for the record, we hereby set down a few fundamental facts.

The machine tool industry was started by Yankee ingenuity, its cradle having been New England. Later it developed into a national industry. Its periods of greatest growth and of the advancement in the design of its products have been in peacetime, not wartime. For every year during which it derived most of its business from war demands, it went through over ten years dependent on peacetime industries. No "war baby" could survive on that basis.

Leaders of the industry long have preached that war business brought in its wake an aftermath of difficult readjustment which dissipated any possible profits which had been made. That was the history of the first world war; they feel it will be the history of the second world war. That is why they look distrustfully and apprehensively to the future, wondering what the post-war period will bring.

Machine tool builders could have gone hog wild in response to foreign pressure, particularly from the Allies. But they haven't. They have not adopted the policy of drink and be merry today and let tomorrow take care of itself. Instead they have refrained from plant expansions wherever possible, resorting to every other means first to produce more goods. For that demonstration of keeping their head they deserve commendation.

So far as profits are concerned, everyone familiar with the industry knows that it is the wildest fluctuating business of all to be in. One good year is likely to be followed by four bad ones. Nowhere else is the policy of storing up profits to take care of a rainy day so essential. In spite of this necessity, the industry's price policy has been conservative.

In the midst of bombs bursting in air, we should not lose sight of the fact that machine tools are rooted in our peacetime economy. Their precision work makes possible manufacture of parts in dozens or thousands so exactly like each other they may be interchanged or substituted for each other in assembly or repair. They are the heart and essence of mass production. Without them we would not have available to everybody automobiles, typewriters, telephones, radios, safety razors.

This is no attempt to paint the machine tool industry lily-white. It is an effort to point out that it has been built up by substantial honest individualistic Americans who above everything else have taken pride in their workmanship and in the contribution which their industry has made to the American way of life.

Burnham Finney

GAGING BUSINESS

U. S. rearmament program should keep metal-working plants busy for many months. Aircraft industry swings into huge expansion program, with machine tool companies expected to follow shortly

The metal-working industry, key industry in national defense, has a job cut out for it in connection with the U. S. rearmament program which will keep it going at top speed for many months. One of the retarding factors is likely to be a shortage of skilled men, but a growing number of companies are establishing short-term training schools.

Machine Tools—May was another month of heavy bookings by machine tool builders. Incoming orders were so large, in fact, that deliveries now are even less favorable than they were thirty days ago. Sales to domestic users are reported to make up 60 per cent of the current volume. Aircraft companies and other firms tied in with national defense are the leading buyers. From abroad the bulk of recent contracts has come from the British and French. Almost all machine tool companies are limiting the amount of business to be taken from foreign sources, consequently cannot fill any more orders for delivery abroad this year. Japan is understood to have contracted for machine tools to be supplied in 1941. Output of the machine tool industry this year is estimated at $350,000,000. Further expansion of capacity is likely to enlarge that figure considerably. At present around 40 per cent of the industry is operating two or three shifts and the remainder is running at least 50 hours a week.

Aircraft—In anticipation of huge government orders on top of the big demand from the Allies, airplane makers already have started to expand. Boeing has announced it will double its capacity. Its backlogs have increased in a single month from $26,000,000 to $47,000,000. Bell Aircraft has gone to two shifts of 10 hours each. Wright Aeronautical has bought a textile plant in Fairlawn, N. J., to be used for making engine parts. Glenn L. Martin has unfilled orders totaling $92,000,000, is running three shifts a day, and will be fully engaged at the present rate for the next eighteen months. Incredible as it seems, informed sources insist that the Allies have still not signed firm contracts for the advanced types of U. S. warplanes made available late in March. Recent "purchases" refer to options which reserve a place on a company's assembly line. Actually, production of warplanes is less today than last November.

Munitions—Intensive warfare in France has accelerated Allied orders and inquiries. The Heil Co., Milwaukee, is building 145 tanks for the French at the rate of eight a day. American Car & Foundry is reported to have secured a sizable shell contract. Both French and British are asking for bids on several important shell production jobs. One company is rushing to completion an order for guns and ammunition from the Finnish government. The original provision for $16,000,000 for educational orders has been restored to the Army appropriations bill.

Railroad Equipment—Class I railroads reached a ten-year peak by putting into operation 27,809 new and rebuilt freight cars in the first four months of 1940. Pullman-Standard has obtained orders this month for 200 covered hopper cars, 100 flat cars and 1,000 box cars. The Great Northern is receiving bids on 1,000 box cars. The Navy Department will buy eleven diesel electrics and the War Department 50 gasoline cars. Locomotive inquiries include four for East Africa, twelve for the Western Maryland, and four to seven for the Detroit, Toledo & Ironton.

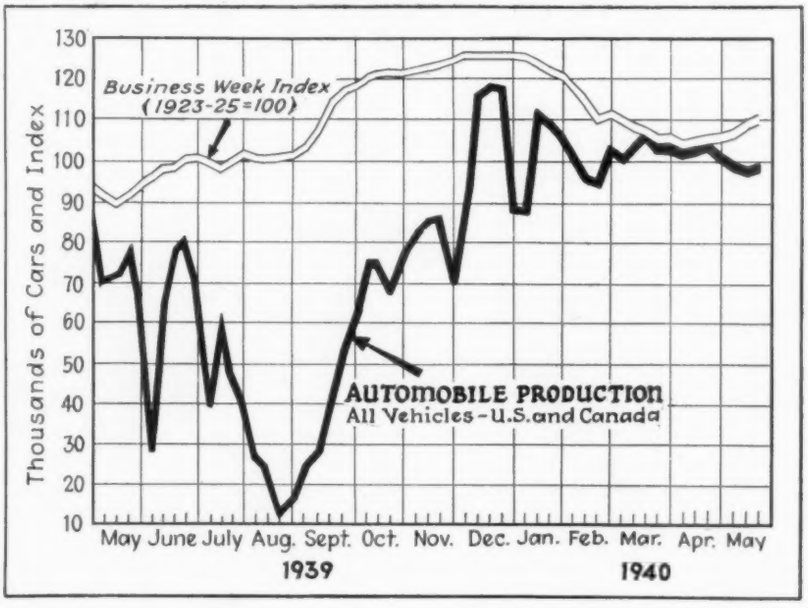
Farm Equipment—The effect of the recent drop in farm prices cannot yet be determined. Some tractor manufacturers, notably International Harvester, are working hard to catch up with orders, but others are on a four-day week.

Gears—Gear manufacturers have recently experienced a considerable expansion in sales. The volume in April was 12 per cent above that in March and 45 per cent better than in April a year ago.

Steel—Steel operations are at the best level since January. Orders placed by the Allies are helping to sustain production above 70 per cent. The chances of a quick German victory are keeping many buyers from stocking steel too heavily. National defense needs will be sizable, though it is too early to measure them accurately.

AUTOMOBILES PRODUCTION VS. GENERAL BUSINESS

Despite adverse influence of the war on Canadian sales, production of automobiles remains firm. Activity is not expected to drop sharply



U. S. to Adopt Standardized Plane Designs

Models in each classification will be selected. Production to be parcelled out to many builders regardless of design owners. Engine-plant expansion will be considered first in the program

By ROBERT COLBORN

WASHINGTON—The first step towards expansion of aircraft capacity is to be standardization of types. Perspective is that a few models will be settled upon in each classification and the job of producing them will be parcelled out among manufacturers with little regard to proprietorship. Engine expansion is still the potential bottleneck, and this is getting first attention.

Secretary of the Treasury Morgenthau, who has for several months had the job of coordinating aircraft production, has hired two engine technicians to help him decide what engine types to standardize on. One is Dr. George J. Mead, vice chairman in charge of power of the National Advisory Committee for Aeronautics and former chief engineer of Curtiss Wright and of Pratt and Whitney, who will have the title of assistant to the secretary. Assisting Mead will be Prof. Edwards S. Taylor of M.I.T. Whoever manufactures the type selected will license the government to produce it, and the government will sub-license whatever manufacturers it wants to have do the job. Morgenthau says that he has not run into any reluctance to license production, but in any case a 1918 law empowers the government to take any design and settle the amount of compensation in the courts.

The next step, distributing the work, will be a production problem. It is already clear that manufacturers will be subjected to far-reaching regulation. Probably each firm is going to be told what to produce and how much. There is little question that the three firms making engines of 1,000 hp. and over—Curtiss-Wright, Pratt and Whitney, and Allison—will be told to concentrate on these and let other plants handle the smaller stuff. A similar procedure is going to be followed on airplanes, as soon as engine program is put underway.

There is room for considerable increase in airplane output without plant expansion. For one thing, standardization ought to increase the theoretical capacity without any change in physical set-up. Moreover, Congressional hearings on our defense program have confirmed the growing suspicion that the airplane industry is currently operating at little over a third of capacity. This results from recent plant expansions, much of it financed from abroad, to meet expected allied orders which failed to come through in the volume anticipated.

Estimate 2,400 Planes a Month

People who ought to know agree that with full utilization of existing facilities on a 2½ shift basis we could produce 1,000 to 1,200 military airplanes a month. Actual production is far below this; it rose to a peak of 346 units last November and has since declined to something under 300. Air Corps Chief H. H. Arnold expected, before the present excitement, that production would reach 800 units a month late in the summer. However, it now appears that there will be immediate physical expansion of plant. Arnold estimates that the maximum practicable expansion could drive capacity, figured on present production methods up to 2,400 units a month by December of this year. With standardization, this figure might be higher.

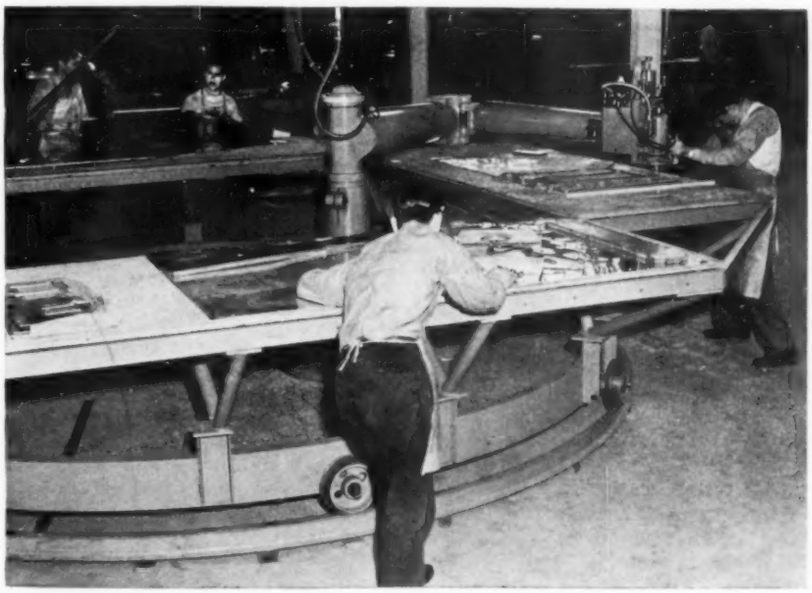
Plans for stimulating plant expansion have not yet been revealed and have probably not yet been formulated. What worries the industry is putting money, borrowed or otherwise, into plants that may become useless in a few years.

Another possibility, which has a few airplane people worried, would be to bring in the auto industry. Airplane people insist they are just as good at mass production as anyone if they get orders big enough to permit it, and say that retooling auto plants for aircraft and training the workman would cost as much and take as long as building a new plant.

None of this, of course, adds up to the 50,000-plane air force that the President suggested in his defense message. Airplane purchase figures in the Military appropriations, make it clear that, as long as the Allies are in the market, most of the expanded production will go abroad. A capacity of 50,000 airplanes a year is something else again and might conceivably be reached late in 1941 or in 1942.

EDUCATIONAL ORDERS REINSTATED

WASHINGTON—The 1941 fund for educational orders has been reinstated by the Senate in the Army Appropriation Bill at $16,250,000. It is probable that firms with experience in war production will not bid on the educational requirements, because there is little profit in it. Result will be that the War Department will have even more difficulty than it has had in the past in getting bids on these orders.



Double Duty—*Production on radial routers at Vultee Aircraft has been increased 250 per cent by adopting cycle operation. Set-up consists of four tables mounted corner to corner on a circular track. Two routers operate simultaneously over two tables while other two are reloaded*

Defense Legislation Being Rushed In Congress to Speed Huge Arms Program

Army will get artillery, mobile equipment, anti-aircraft guns, and an unlimited number of planes through bills now pending

WASHINGTON—Among the few certainties on defense legislation, as of today, are these: (1) Even after Congress passes pending bills, the whole set-up might be changed very quickly as a result of trends in Europe's war, either by a special session this summer or by the new Congress in January; (2) The administration has almost complete of Congress and can do pretty much what it wants to; (3) A tremendous armament program is inevitable, whether the Allies win or lose; (4) The 50,000-airplane objective is simply a wish expressed by the President—legislation now being passed merely takes steps in that direction; (5) Such an air power is well within the range of possibility during the coming two or three years.

The Army has two important defense bills pending as this is written. One would repeal the present provision limiting the air corps to 6,000 planes and instead authorize the Army to buy as many planes as Congress will pay for; the sky would be the limit.

The other Army bill is the regular War Department appropriation for 1941. It calls for $1,820,000,000. This is $712,712,274 more than the House asked for before the invasion of the Low Countries.

This bill provides for additional air corps planes as follows: 309 combat planes, 2,237 training planes, 20 miscellaneous—total 2,566. The present expansion program calls for a total of 5,500 planes including those building and on hand. The Air Corps would thus have 8,066 planes when the pending expansion program is completed. Of course this means little, because more planes can be authorized at any time.

Besides aircraft, the bill provides for substantial increases in anti-aircraft guns, small arms, field artillery, tanks, tractors and trucks, railway artillery, ammunition, gas masks, uniform cloth and signal corps equipment.

Of the vast amount of cash in the bill, $14,250,000 goes to educational orders, giving that project all the funds originally authorized; signal service, $40,243,000; Air Corps, $100,124,256; Army Engineers, $14,199,000; Ordnance Department, $214,454,319; repair of arsenals, $2,062,500; seacoast defense, $14,526,396.

In addition to cash the Army bill provides $323,000,000, in contract authorizations. Included in this sum are $103,300,000 for airplanes; $133,744,679 for Ordnance equipment; $1,700,000 for Signal Corps; and $66,000,000 to be included in the President's "Emergency Fund" of $132,000,000.

The purposes of the President's fund are couched in rather vague language. Included among them are such things as furnishing Government owned facilities to private plants; training of civil personnel for production of critical equipment; procurement of strategic and critical materials, plant expansion, if necessary, for aircraft manufacturers.

Canada to Have Role in Allies' Production Program for Supplies

MONTREAL—With the recent shift of events in Europe, Canada is preparing to supply as rapidly as possible airplanes and other war machines to the Allies, to replace those being destroyed. Negotiations by Britain for purchase from Canada of munitions and armament are now being wound up, and as soon as possible it is planned to throw Canada's industrial machine into war work on a scale not seen since the latter years of the 1914-1918 World War. It is planned to spend $2,000,000 a day on the war effort during the current fiscal year.

With a view to centralizing administration of the war effort, a separate minister of defense for air is to be established, and C. G. Power, hitherto postmaster general, is to be appointed to the post. C. D. Howe, who has been transport minister, is slated for separate minister for munitions and supply. Col. C. G. Gibson of Hamilton is reported likely to be named a minister. All the war defense operations will be coordinated under one chief officer, and under one roof. The minister of munitions and supply is to be given special extraordinary powers.

Particularly is the Empire air pilot program for training new air pilots being speeded up. Every effort is being made to get this program well under way in a matter of weeks, instead of toward the end of the year as progress hitherto indicated. Efforts will be made to get planes from the United States or wherever else available for training purposes.

Link Manufacturing Co. has started production at its plant at Gananoque, Ont., of a new type of air trainer. The company has a $600,000 contract from the Canadian government for 80 of the new machines.

LABOR'S PART IN WAR WORK

WASHINGTON—Labor's part in the war production push just ahead is something to watch. President Roosevelt, determined to hold all of his legislative gains for the common man, has said that Wage-Hour, Walsh-Healy and other laws will not be modified. Opinion here is that he will stand for Lewis' threatened organization of war industries and even strikes, up to a certain point. If production pressure should run high in a real emergency, the union leaders probably would join the patriotic parade and soften their demands. Serious trouble on that score is not anticipated. But the old controversy in which the war and navy departments and industrial employers claim unemployment, may boil over. If both parties to the debate are right, then the unions' men are simply not well enough trained. When big production starts, six months or a year from now, the government will have to sponsor training schools, whether the unions like it or not.

Machine Tool Builders Can Expect Increased Regulation

WASHINGTON—Industries connected with the rearmament program can expect a degree of government regulation they haven't seen since the last war. Next on the list after aircraft is the machine tool industry. The President has assigned Secretary Morgenthau to do the same coordinating job for machine tools that he is doing on airplanes. The administration is annoyed at the resistance the industry has shown to plant expansion. Morgenthau had a conference with the industry a few months ago, but it was confined to one subject—to help Wright and Pratt & Whitney out of their difficulties. The plan now is to extend the policy of preferential deliveries to other defense industries.

President Roosevelt has intimated that sometime this summer it may be necessary to divert some machines built for foreign delivery to domestic companies making armament products.

Mr. Morgenthau's view is that more than priorities must be established. There must be plant expansion and lots of it. Who will pay for the expansion is not clear. There will be RFC loans available, and some of the President's blank-check money may be used to build plants to be leased to the industry. If the machine tool people want money, Morgenthau says they will have to ask for it.

INSIDE DETROIT

Thousands of skilled tool and die makers and hundreds of plants will shortly be available for rearmament projects. Aircraft building in Michigan gets new impetus from the War

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—As the 1941-model tool and die program reaches its peak a pressing problem with many managements is to secure skilled men in adequate number. In a city like Detroit, the term "toolmaker" or "die maker" covers a multitude of special abilities and skills. One plant may need men with specialized training on die-casting dies, another on body dies, a third on forging dies. So when a batch of twenty or thirty men is called in, only a few may actually be found suitable.

From all sources, it appears that there is a distinct shortage of better-class mechanics. There are a number of reasons for this condition. First, the tool and die industry works for a comparatively short season, and crowds a tremendous volume of work into the space of a few months. At the peak in even a "normal" season, a shortage of men would exist. Second, this season might be considered "abnormal" in that the volume of tool and die work is said to be greater than in recent years. Third, many first-class men have been hired away by aircraft fuselage and engine builders, by machine builders and by Canadian plants. Fourth, insecurity of employment has driven thousands of skilled journeymen into production jobs or other occupations.

Die Shop Employment Doubled

Employment in many independent tool and die shops is approximately double what it was a year ago at this time. Shop owners attribute this condition to the overflow from one of the largest tool and die programs in recent years, and to a desire by auto manufacturers to farm out work. The 50-hour week is general, nine hours per day and five on Saturday. Operators of jig boring and die-sinking equipment work seven days, nine hours during the week and five on Saturday and Sunday. These "plutocrats" get more in their pay envelopes than squad leaders.

Detroit has over 300 independent tool and die shops, a number of which have worked in recent months on tools and dies required by aircraft engine builders. Others have served machine tool builders in respect to machinery beds and columns. When the automobile tool and die program is wound up in a couple of months, much modernized tool and die plant capacity and thousands of skilled men will be available for work in connection with the rearmament program. Furthermore, it is understood that additional thousands of workers who have left the trade might be called back and found suitable after a short period of retraining.

Domestic Sales Strong

Scattered reports indicate that critical war news has not disturbed strong domestic automobile sales, but may have impaired Canadian deliveries. Assembly operations remained relatively stable throughout May and might total nearly 400,000 units. June operations, at reduced levels, are not expected to taper sharply as the model changeover approaches in early July. Perhaps 350,000 units will be assembled during the month, bringing the six months total to approximately 2,500,000, or 22 per cent better than a year ago.

Aircraft Firm Organized

First Michigan firm to incorporate for production of aircraft, since the President's declaration that such plants be established in the Midwest, is Tucker Aircraft Corp., 2493 East Grand Blvd., Detroit. Incorporation papers authorize the concern to do a general aircraft business as well as a general munitions business. Officers are: Preston Tucker, president; John W. Leduc, vice-president; Arthur C. Lardon, vice-president and Walter G. Carlson, treasurer. Authorized capital, $1,000,000; paid-in capital, $510,000.

Heading up design activity as vice-president is Arthur C. Lardon, who has held important engineering positions with Glenn L. Martin and Bellanca, and who is credited with development of six successful aircraft designs.

"HYSTERICAL BUNK"

DETROIT—Reports credited to Washington that automobile plants must go on a 24-hr., six-day-week basis for ten months to fill Army's immediate requirements are considered hysterical bunk by those familiar with the industry. First, most local facilities are devoted to passenger car production and are built solely for that purpose. Second, even in truck plants, Army orders are built partly by standard production-line procedure and partly by batch manufacture to handle special features. Third, available facilities are largely unsuitable for combat cars and tanks. Fourth, months would be required to change over to military production even if desirable. Fifth, airplane motor manufacture is vastly different from automobile motor manufacture; most present equipment is entirely unsuited for it. Besides, personnel all down the line are unfamiliar with aircraft problems and technique.

Screen Test—*Superfinished Dodge piston pins are checked to within 0.0001 in. with this device. Pins are pressed against polished steel blocks having Carboloy points, operating a diamond-tipped plunger*

AMA Hears Machine Tool Builders Can Look For $350,000,000 Total Business This Year

Many plants are working two or three shifts a day. Contrary to opinion, exports are now limited to 40 per cent of total output

NEW YORK—The machine tool industry will do a business of $350,000,000 this year, said Raymond S. Perry, vice-president Ingersoll Milling Machine Company, at the meeting of the Production Division of the American Management Association in this city May 22-23. Mr. Perry is vice-president of the association in charge of that division.

Mr. Perry reported that a poll taken by the National Machine Tool Builders' Association shows that 40 per cent of the industry is operating two or three shifts and the remainder over 50 hours a week. Almost all companies in the industry have limited sharply the percentage of plant output available for foreign delivery. Export business now makes up about 40 per cent of the industry's total.

Contrary to the impressions given in a recent article in a national magazine, Mr. Perry emphasized that foreign buying in this country has been sane and sober, on the whole, and mostly has been done only after long and careful negotiation. He said that machine tools are bought on a performance basis, not on price per pound. He pointed out the difficulty of trying to compare prices of machine tools because of so many dissimilar types and because tools of today are so far in advance of those produced ten to twenty years ago.

His company has met the present emergency, said Mr. Perry, by limiting the volume of export sales, by not expanding plant capacity, and by increasing output wherever possible by replacing old equipment with new.

Organizing for cost reduction was the theme of the association meeting. Discussions centered around ways and means of organizing the entire working force for an attack on costs. In his remarks at a luncheon session, William L. Batt, president SKF Industries, Inc., said that the security of the worker in his job is becoming increasingly important. Companies should try to regularize employment not by tackling the whole job at one time, but a piece at a time.

Ray Perry, left, vice-president Ingersoll Milling Machine Company, and William L. Batt, president SKF Industries, grin at the applause which greeted Mr. Perry's talk before management meeting

IF HITLER WINS

WASHINGTON—Unless the war is followed by general disarmament, which is unlikely, all nations will start mechanizing their armies with planes, tanks, armored trucks, motorized guns. Much or most of this business, together with all manner of orders for food and supplies, would come to the United States, and would help to offset the bad effects of a peace dictated by Hitler, should he win. Government economists believe that this country's trade would not suffer materially for several years following a German victory, until Hitler had time to consolidate his new territories and advantages over England and France under new trade agreements.

Iron & Steel Institute Told Industry Can Gear Itself Quickly to Meet Defense Needs

NEW YORK—If government will decide upon a definite defense policy, the country will be surprised at the speed and efficiency with which industry will do its share of the job, declared Ernest T. Weir, chairman National Steel Corporation, in his presidential address at the annual meeting of the American Iron & Steel Institute May 23.

Industry is our first line of defense, said Mr. Weir, and there must be a minimum of red tape and delay in permitting industry to gear itself up to meet defense necessities. Happily, the steel industry is at the highest state of technological development in its history to meet these demands.

Mr. Weir said that, in his opinion, the stocks of scrap steel in this country are entirely too low. In the interests of national safety, a limitation should be imposed on their export. He discussed the fact that seven of the twelve principal non-ferrous materials used by the steel industry come largely or entirely from foreign sources. Economists estimate that $800,000,000 of these vital materials must be imported for defense purposes, yet less than $13,000,000 actually has been bought.

Taking to task the administration, Mr. Weir inquired why the country is so defenseless after seven years of spending billions of dollars. He said he is firmly convinced the United States has no place in this war, that the only reason that can justify war far America is jeopardy to the independence of the United States or invasion of this hemisphere.

Earl C. Smith, chief metallurgist, Republic Steel Corporation, urged more standardization by the steel industry on steels used in sizable quantities which can replace without difficulty many hundreds of small volume, high cost, special steels. Methods of specifying steel to allow manufacture in advance of specification should be encouraged. A more even flow of production would thus be encouraged.

If the consumers would modify their inflexible manufacturing programs, a great deal of the increased cost of steel production would not be necessary, asserted C. H. Herty, Jr., Bethlehem Steel Company. Cooperation of consumers in making possible better rolling schedules will shorten the time necessary for development of such improvements, said A. C. Cummins, Carnegie-Illinois Steel Corporation.

An innovation in institute meetings was a panel discussion on industrial relations at the afternoon session. Hon. Raymond E. Baldwin, Governor of Connecticut, was the speaker at the dinner. E. L. Ryerson, Jr., chairman Inland Steel Company, discussed the commercial problems of the steel industry at the morning session. Frank Purnell, president Youngstown Sheet & Tube Company, commented on the financial problems.

Management's Responsibility Highlighted In Meeting of Metal Trades Association

Better employer-employee relations will result from mutual understanding of one another's problems, according to most observers

NEW YORK—Management's responsibilities were outlined by Nelson W. Pickering, president Farrel-Birmingham Company, Inc., in his report as president at the annual meeting of the National Metal Trades Association May 21-22.

These responsibilities are (1) to see that industry tells its story simply, forcefully and straight-forwardly; (2) to have a constructive employee relations policy; (3) to see that the supervisory force understands its job and recognizes the foreman's importance; (4) to develop mutual understanding between management and men; (5) to understand the forces operating in the world today, appraise them realistically and make management's influence felt; (6) to understand and sympathize with the legitimate aims of every man to improve his lot in life; and (7) to refrain from any action making it necessary for workmen "to pay tribute to a walking delegate in order to be employed."

Mr. Pickering said that the association's job rating plan has been installed in 200 plants and its employee rating plan in 125 plants. Very few members have been involved in strikes the past year.

Speaking on "Mutual Understanding," William A. Carson, president Sunbeam Electric Manufacturing Company, said that for years his company has made it a practice to take employees into their confidence and tell them frequently the condition of the business and the problems faced. A public address system with 26 loud speakers, one in every department, is used effectively for this purpose.

Next to job security, the employee is most vitally interested in his rate and amount of pay, remarked Mr. Carson. Most employees will do a fair day's work if they are convinced they will get a fair day's pay. A thorough job analysis program instituted by the company benefited both employees and management in the greater satisfaction of employees with their jobs.

Foreman training, said Mr. Carson, should be built around the idea that the foreman is the manager of a small but complete business. Foremen should be made to feel that the men who work for them are their employees and that their labor relations responsibilities are identical to those of a manager of a small business. The foreman must be a leader, teacher and diplomat as well as a technician, said Mr. Carson in conclusion.

A panel discussion of employee-employer relations was a feature of the meeting. Those leading the discussion were H. H. Kerr, president Boston Gear Works; Colonel J. B. Dillard, Cleveland Twist Drill Company; G. W. Cannon, Campbell, Wyant & Cannon Foundry Co.; A. L. Frost, Sargent & Company; N. R. Knox, Bucyrus-Erie Company; and A. W. Hawkes, Congoleum-Nairn, Inc. A. S. Redway, Farrel-Birmingham Company, Inc., talked on "Putting Job Rating to Work." Governor Raymond E. Baldwin of Connecticut was the dinner speaker.

Two Aircraft Firms Organized To Produce Planes in Michigan

DETROIT—Plans to incorporate a new aircraft enterprise were under way last week at the Stout Engineering Laboratories in Dearborn. William B. Stout, well-known designer of the Ford airplane and automotive engineer, has developed a method of fabricating aircraft structures from thin-gage stainless steel. This method is aimed at placing manufacture of aircraft fuselages on the same production basis as enjoyed in automobile sheet-metal fabrication.

The new company had not been named at the time of writing, but it is understood that it will function to license construction and methods patents to manufacturers of military and commercial aircraft. Officers of the company also mentioned that plans were being formulated to set up a plant for the manufacture of training planes.

The Stout method involves spot-welded composite corrugated and stressed-skin construction. Advantages of the construction are said to be: (1) speed of fabrication, (2) structural stiffness and lightness, (3) much lower cost. A joint across a 2-ft. sheet can be welded in seven seconds by the well-known hydromatic welding process. Parts would be stamped or formed, laid in jigs, and assembled by spot welding in a manner comparable to automobile body production.

Adoption of the new fabrication process would reduce the cost of training planes to around $1,000 each, in the opinion of Stout engineers, when volume production is attained. At such a figure the inventor envisions the time when a hundred thousand training planes in the hands of civilian pilots would form a valuable adjunct to national defense. It is not to be expected that the new method can revolutionize aircraft production over night, because most of the large military aircraft producers are now accustomed and tooled up to fabricate duralumin.

A second Michigan venture into aircraft manufacture is seen in formation of Continental Aviation & Engineering Corp., a subsidiary of Continental Motors Corp., Muskegon. Clarence Reese also heads the new company, which is a Virginia concern authorized to engage in manufacture of aircraft, motor vehicles and engines. Company sources were reticent to disclose plans, but intimated that manufacturing facilities would probably be established at Muskegon.

NO MUNITIONS INCREASE

WASHINGTON—There has been no increase, following Germany's new invasions, of ammunition and munitions deliveries to our own services and to the Allies. Nor will there be any appreciable change in the near future. Results of legislation for vast quantities of weapons and war goods will not begin to show for six months to a year. First activity will be in the collection of steel and steel shapes, and in import orders for strategic and critical materials.

NEW CANADIAN WAR ORDERS

MONTREAL—Contracts placed by the Department of Munitions and Supply during the first two weeks of May numbered 1,739, with total value of $18,116,279. These recent contracts included:

Mechanical Transport—Laurentide Equipment Co., Ltd., Montreal, $9,857; Ford Motor Co. of Canada, Ltd., $322,612; General Motors of Canada, Ltd., $6,880; Canadian Top & Body Corp., Ltd., Tilbury, Ont., $70,735; Frost & Wood Co., Ltd., Smiths Falls, Ont., $32,085; Brantford Coach & Body, Ltd., Brantford, Ont., $32,085; Cockshutt Plow Co., Ltd., Brantford, Ont., $24,955.

Aircraft Supplies—British Air Ministry, $889,446; British Aeroplane Engines, Ltd., Montreal, $49,500.

Machinery, Tools and Hardware—Williams & Wilson, Ltd., Montreal, $16,876; John T. Hepburn, Ltd., Toronto, $10,449; Rudel Machinery Co., Ltd., Montreal, $15,904; Robert Mulhall, Ottawa, $14,218; Walter W. Wickware, Ottawa, $13,632.

Munitions—British War Office, $59,946.

Shipbuilding—North Bay Steamship Co., Ltd., Halifax, $36,000.

WATCHING WASHINGTON

Bills to expand the navy, establish new air bases and increase naval air strength lead the National defense program. War lessons will change some construction features of American planes

BY BLAINE STUBBLEFIELD

WASHINGTON—While Army airplanes are playing lead in the war music, the Navy, which is still the chief weapon of American defense, is getting the most attention at present. Some of the Navy bills already passed by Congress may be changed overnight; new ones undoubtedly will be introduced. Here is the score as we go to press. It indicates closely what the Navy program will be.

1. One of the bills would relax to some extent the 10 per cent profit limitation on shipbuilding. There is a 12 per cent profit limit on naval aircraft construction but apparently that will not be changed.

2. Another bill provides for the speeding up of the construction program by negotiation of contract, and modification of bidding requirements; permits the Government to defray the cost of special and additional equipment needed in private shipyards; and provides for 30 per cent advance payments on some building contracts.

3. Based on a sudden decision of the President to strengthen the Bureau of Aeronautics, a bill is pending to authorize the increase of air power from 3,000 to 10,000 planes; to train 16,000 pilots and to expand the shore bases. Officers estimate 16,000 pilots could be trained by 1944.

4. A bill was introduced some time ago in the House which would consolidate the Bureau of Construction and Repair and the Bureau of Engineering into a Bureau of Ships. The latter would have full responsibility for shipbuilding. Now, an identical measure has been introduced in the Senate.

5. An amendment to the Vinson-Trammel act would permit a shipbuilder to carry over any net losses as a credit against any possible excess profit that might be earned in the next four years.

6. The regular Naval Appropriation bill for 1941, providing $1,458,756,728, includes a fund of $250,000,000 requested by the President to build up naval aviation already authorized; gives FDR a "blank check" for $68,000,000; allots $54,776,000 for increased enlisted strength; and adds $100,000,000 contract authorization for the air bureau.

7. There is a naval aviation expansion bill which would provide a system of air bases to cost about $100,000,000. Two amendments would provide $10,000,000 for auxiliary bases where deemed necessary, and $10,000,000 to acquire naval reserve air bases in territorial United States.

8. A bill providing 11 per cent expansion of the entire navy establishment is pending before the Senate and might possibly be stepped up to the 25 per cent originally proposed and sought by the Navy. Whatever the percentage of increase, President Roosevelt will call for $50,000,000 to start work on the new naval construction as soon as the bill can be signed.

Sentiment is increasing in Congress for a reversal of it's position taken last year for the immediate fortification of certain Pacific islands.

War Lessons to Affect Plane Construction

Much is made in the press of Air Corps' admissions that U. S. fighting planes are inferior to the Germans'. What was actually said was that, as airplanes, American ships compare favorably with others but that they lack certain German gadgets revealed by the war. These are the self-sealing gas tank, protective armor on some types, and heavier armament. None of our airplanes have such equipment, but it can be installed on all at a cost of about $8,000,000. The German developments were revealed when their planes were brought down. Precautions are being taken to see that our pet secret—the bomb sight—isn't made public in the same way. A charge of dynamite is put in it and rigged so that if the plane crashes the sight will blow up automatically. We build our aircraft to last ten years, but maybe there isn't much sense in that if it's going to be shot down in two months or made obsolete in twelve.

Why German Gas Tanks Are Bullet Proof

The German innovation that has most startled our Air Corps as well as the Allies is the leak-proof gas tank. We experimented with them years ago but gave them up as too heavy. Here is how the German tank worked: The inside of the tank was of stamped fiberboard, over which was a layer of cured rubber, then a layer of crude rubber, then more cured rubber, and on the outside leather. When a bullet went through, the crude rubber closed up, while the leather held the tank in shape. This construction has proved successful.

War Equipment Costs Given

Did you ever wonder how much a machine gun costs? Or a nice 1941 light tank? Such figures are hard to come by, but here are samples of what you would pick up if you sat in military affairs hearings long enough: 144 tanks, light, with armament, $3,600,000; 297 cars, scout, with armament, $2,821,000; 144 tool sets for light tank, $7,200; 407 telescopes, $10,175; 36 machine guns, without tripods, $5,220; 130 anti-tank guns, 37mm, $650,000; 16 trainers, tank gunnery, $24,000.

Wagner Act Amendment Unlikely

Amendment of the Wagner Act this session seems sure to fail. "Your Honor" Judge Smith, as they call him on the Hill, has been dragging his hearings along, but the House has found excuses, from week to week, for not taking up the proposed amendments. Decisive defeat of the Wage-Hour amendments some days ago was taken to indicate the fate of NLRB changes. Only one thing could now hoist the Wagner bills of amendment out of the limbo in which they lie forgotten: pressure for production of defense equipment, for domestic use and export, is bringing a demand for relaxation or suspension of wage-hour, Walsh-Healey and other labor laws. Enemies of the Wagner law might seize this opportunity to file its teeth down. Then too, Congress might run out of other legislation to work on, if the war stays at status quo.

Need for Anti-Aircraft Guns Limited

Demand for a big program of anti-aircraft defense and charges that there are fifty times as many anti-aircraft guns around London as there are in the whole United States don't impress the Army. They admit that their whole critical items program provides for only 317 of the 90 mm. guns but point out, brutally, that where London might be subjected to continuous attack by thousands of bombers, New York need only fear raids by a few hundred bombers operating from carriers. The practical defense is to sink the carrier—to prevent establishment of bases within range of us.

American Gear Manufacturers Indorse National Preparedness Program for Our Armed Forces

Manufacture, inspection and new developments in fine-pitch gears covered. U. Seth Eberhardt elected as new president

ASHEVILLE, N. C.—A resolution passed by the American Gear Manufacturers Association at its 24th annual meeting, May 20–22, strongly indorsed the move to build up the nation's military forces. The three-day gathering was held at Asheville, N. C., with the Great Smoky Mountains as a fitting setting.

The manufacture and inspection of gears received considerable attention in the technical papers. E. P. Blanchard, The Bullard Co., discussed the boring mill as a means of machining gear blanks. He showed that both single and multiple-spindle machines found application in shops handling lots of limited size.

New developments in the manufacture of fine-pitch gears were described by D. T. Hamilton, Fellows Gear Shaper Co. This speaker showed that speed and accuracy are successfully combined in producing gears of 30 D.P. and finer.

The nature of pitting was the subject of a paper by Dr. Stewart Way, Westinghouse Electric & Mfg. Co. Dr. Way gave a thorough analysis of gear tooth wear based on tests.

A. A. Ross, General Electric Co., spoke on his experience with gear-tooth forms. He traced the changes in tooth profiles from the radial flanked tooth used in 1902 to some of the generated forms found in current designs.

Tooth bearing in bevel gears was treated in a paper by A. H. Candee, Gleason Works. The various factors which affect tooth bearing and the means of obtaining good contact were clearly set forth.

Because of the pressure of business, Austin Kuhns, Farrel-Birmingham Co., was unable to present his paper "Diesel and Gas Engine Load Characteristics." However, the paper was read by M. Hulett of the same organization. "How's Business?" was the question answered in an address by W. L. Schneider, Falk Corporation. The speaker analyzed sales problems with emphasis on the methods of maintaining sales at a healthy level.

The dinner meeting was addressed by George F. Nordenholt, editor, *Product Engineering*. His subject: "New Products, a Threat or Promise."

Included in the many A.G.M.A. standardization activities was the adoption of a recommended practice on inspection and tolerances for spur and helical gears.

New officers elected at the convention are: U. Seth Eberhardt, Newark Gear Cutting Machine Co., president; W. P. Schmitter, Falk Corp., vice-president; J. C. McQuiston, re-elected secretary; and R. S. Marthens, Westinghouse Electric & Mfg. Co., treasurer. The new executive committee members are: R. C. Ball, Philadelphia Gear Works; A. H. Candee, Gleason Works; W. A. Barr, Foote Bros. Gear & Machine Co.; F. B. Drake, Johnson Gear Co., and U. Seth Eberhardt.

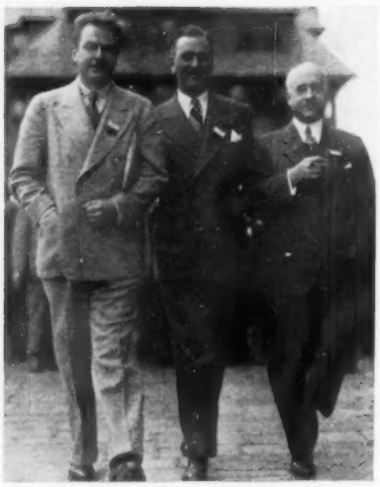
U. Seth Eberhardt, Newark Gear Cutting Machine Company, has been elected president of the American Gear Manufacturers Association

W. P. Schmitter, chief engineer of the Falk Corporation, is A.G.M.A.'s new vice-president

Granger Davenport, Gould & Eberhardt; J. C. McQuiston, A.G.M.E. secretary, and R. S. Marthens of Westinghouse Electric & Manufacturing Company and A.G.M.A. treasurer talk things over after a meeting

Left—W. L. Schneider, Falk Corporation. Center—Douglas T. Hamilton, Fellows Gear Shaper Company. Right—E. P. Blanchard, Bullard Company. All three addressed the Gear Manufacturers Meeting in Asheville

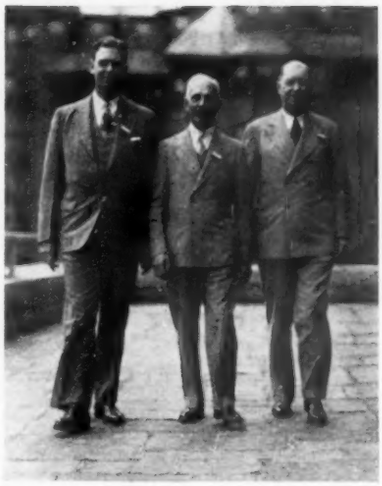
MACHINE TOOL DEALERS STRESS DEFENSE PROBLEMS



E. A. Lynch of Edward A. Lynch Machinery; E. W. Lafferty of Swind Machinery; T. W. Carlisle of Strong, Carlisle & Hammond

Speakers believe machine tool industry to be capable of meeting all war-time demands. High proportion of domestic business to foreign shipments emphasized

John Sauer, Jr., of Peninsular Machinery, president Associated Machine Tool Dealers of America



Dan Harrington of Wilson-Brown strolls with C. M. Hammersly, Calco Machinery, and Jack Carlton, Carlton Machine Tool

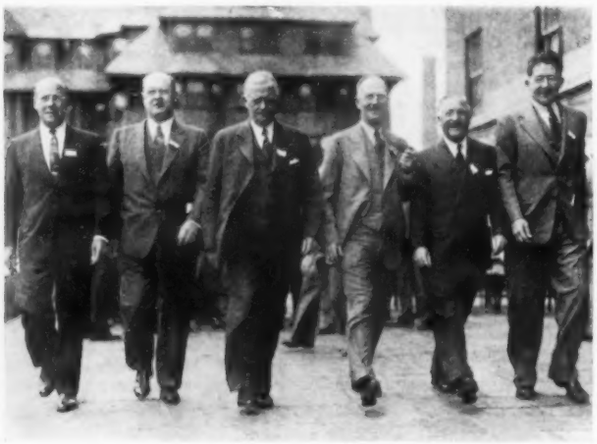
ATLANTIC CITY—Problems connected with national defense were discussed at the spring meeting of the Associated Machine Tool Dealers of America here May 13-14. The sessions were under the able direction of President John Sauer, Jr. In addition to the regular program, which included a dinner, an inspection of the Frankford arsenal of the U. S. War Department was made.

A large proportion of the machine tool industry's production has been allotted to domestic requirements, despite the heavy foreign demand, stated John E. Lovely, president National Machine Tool Builders' Association and vice-president Jones & Lamson Machine Co. He pointed out that by February 1 of this year most machine tool companies had sold out their foreign quotas for the remainder of 1940.

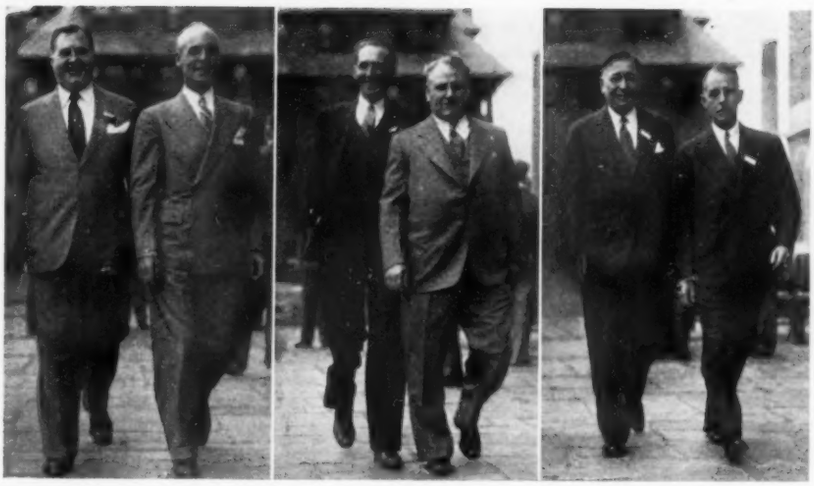
Mr. Lovely stressed that the resourcefulness of the industry in meeting the plans of aircraft engine builders leads one to believe that machine tool builders can successfully play their part in any program looking to the safeguarding of the nation.

Machinery now being designed along simplified lines to machine shells in case of war is only to be used until high-production machines can be built in sufficient numbers to replace it, according to Tell Berna, general manager of the National Machine

Above, left, is John Cetrule, Triplex Machine Tool Corporation. Next come E. F. Motch and E. R. Motch, Jr., Motch & Merryweather Machinery Company; W. F. McCarthy, Henry Prentiss & Company; J. Roy Porter, Marshall & Huschart Machinery Company; and J. W. Wright, Colcord-Wright Machinery & Supply Company



At the left are George H. Cherrington, Brown & Zortman Machinery Company; George J. Zimmerman, Strong, Carlisle & Hammond Company; Hugo Olson, Sundstrand Machine Tool Company; R. M. Carter, H. A. Smith Machinery Company; W. M. Fairbairn, Barnes Drill Company; and W. W. Radcliffe, The E. A. Kinsey Company



Harry Barney, Barney Machinery Company, and G. J. Hawkey, Cleveland Duplex Machinery Company, are shown at left. In the center are J. E. Livingstone, John E. Livingstone Machinery Company, and P. W. Brown, Wright Aeronautical Corporation. At right are William K. Stamets, Wm. K. Stamets, and L. H. Pratt, Henry Prentiss & Company

Tool Builders' Association. Mr. Berna recited the inadequacy of the army arsenals to meet the country's shell demands in time of war.

Higher speeds and feeds are important factors in machine tools designed for the airplane industry, declared D. N. Macconel, Machinery Sales Co., Los Angeles. He said that one aircraft company is milling duralumin parts at a speed of 60 ft. a minute. About 45 per cent of the shop equipment going into airplane plants today consists of machine tools and another 45 per cent is sheet metal machinery.

Other speakers included Colonel L. H. Campbell, Frankford arsenal; Burnham Finney, editor AMERICAN MACHINIST; Commander H. M. Scull, U. S. Navy; F. W. Schiefer, R. F. W. Schiefer Machinery Co.; and Dr. Allen A. Stockdale, NAM.

NAMES in the NEWS

D. D. Francis, former vice-president National Bronze & Aluminum Co. and president Wheeler-Schebler Carburetor Co., has been elected president and treasurer of Sheet Wire Corp., which has recently been organized in Detroit, Mich., for the manufacture with steel mills and other non-ferrous fabricators of wire, rod and bar materials. A new process of making these commodities from sheet and plate will be used. Vice-presidents of the new company are F. E. Birch, former chief engineer Buffalo Pressed Steel Co., and F. L. Armstrong, former vice-president Thorne Motor Corp. and Gas-Electric Corp. Athel F. Denham, president Denham & Co., Detroit industrial marketing organization, is secretary and assistant treasurer.

Lawrence V. Nagle has been elected president of the Udylite Corp., Detroit, Mich., manufacturer of electroplating and polishing equipment and supplies.

Mr. Nagle graduated from the University of Detroit in 1926, and joined Udylite Corp. in 1932 after having been associated with several firms in a selling capacity. In 1937 he was appointed district sales manager of the Detroit area. Mr. Nagle will continue to direct sales in the Detroit district for Udylite.

S. W. Gibb has been appointed general sales manager of the Philadelphia Div., Yale & Towne Mfg. Co., Stamford, Conn. He succeeds James C. Morgan, who has been promoted to the position of general manager of all Philadelphia operations.

Mr. Gibb joined Yale & Towne in 1920 as district sales manager, operating from Pittsburgh headquarters for the next several years. In 1929 he was promoted to Pacific Coast sales manager, with headquarters in California. By 1931 he was named assistant sales manager for the Materials Handling Div. in Philadelphia.

C. B. Boyne has been appointed manager of stainless steel sales for Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

John H. Elliott has been appointed assistant general superintendent of the Irvin Works of Carnegie-Illinois Steel Corp., succeeding Lawrence S. Dahl, who has been named general superintendent. Arthur M. Krieger has been appointed superintendent of maintenance; John A. Drgon, assistant superintendent of maintenance; Thomas W. Hunter, assistant division superintendent, flat products finishing; Charles A. Larkin, general foreman, cold reductions; William Springfield, lubrication foreman, maintenance; and John Sturdy, maintenance foreman, flat products finishing. Warren W. Scherer has been appointed superintendent of industrial relations.

H. Denbigh Ellis has been elected president of Wilson & Bennett Mfg. Co., Chicago, Ill., subsidiary of Inland Steel Co. He succeeds Wilfred Sykes, who will remain as chairman.

Stewart E. Lauer, president York Ice Machinery Corp., York, Pa., has been elected president of the Air Conditioning Manufacturers' Association. Other officers elected include Stuart M. Crocker, manager air conditioning department, General Electric Co., vice-president, and P. A. McKittrick, general manager Parks-Cramer Co., treasurer.

Paul N. Robins has been elected vice-president and treasurer of Greene, Tweed & Co., New York, N. Y., manufacturer of mill supply specialties.

Howard R. Murphy has been ap-

D. D. FRANCIS

L. V. NAGLE

S. W. GIBB

pointed central division sales manager of Caterpillar Tractor Co., Peoria, Ill.

O. P. Robinson has been appointed to the Pittsburgh sales engineering staff of Cutler-Hammer, Inc., Milwaukee, Wis.

William Taggart, since 1928 associated with the Steel & Tube Div. of Timken Roller Bearing Co., Canton, Ohio, has been appointed manager of tube sales.

OBITUARIES

GEN. OTTO H. FALK

Gen. Otto H. Falk, chairman of the board of Allis-Chalmers Mfg. Co., Milwaukee, Wis., former vice-president of Falk Corp., and a director of National Enameling & Stamping Co., Square D Co. and Harnischfeger Corp., died May 21 at his home in Milwaukee. He was 74 years of age.

Born in Milwaukee, he attended Northwestern College in Watertown, Wis., and was graduated as a captain from Allen Military Academy in Chicago in 1884. In 1912 he became receiver of Allis-Chalmers and served as president of the reorganized company from 1913 to 1932. Since that time he has been chairman.

A. C. Anderson, 66, general foreman Gisholt Machine Co., Madison, Wis., died May 6 at his home in that city. He had recently completed 50 years of service with the firm.

J. E. Hamilton, 88, retired founder of Hamilton Mfg. Co., Two Rivers, Wis., died May 7 in Pasadena, Calif.

Frederick J. Haynes, 69, former president, chairman and general manager of Dodge Bros., Detroit, Mich., died May 3 in a Detroit hospital following a short illness.

Arthur W. Milne, 77, retired industrialist, died recently in Erie, Pa., following a brief illness. He was treasurer of Ball Engine Co., and when that firm was reorganized as Erie Steam Shovel Co., he was elected secretary, treasurer and a director. Shortly after the firm was consolidated with Bucyrus-Erie Co. in 1938, he retired.

William R. Mitchell, executive vice-president National Acme Co., Cleveland, Ohio, died May 8 after a four months' illness. He was 61 years of age.

Born in Syracuse, N. Y., Mr. Mitchell became associated with National Acme in 1902 when a nucleus of the present organization moved to Cleveland to engage first in the screw machine products business and later in developing machinery, tool and allied fields. In 1912 he was made superintendent of the product division, and during the World War served as general superintendent. Subsequently, he served for three years as manager of the Detroit sales division, later returning to Cleveland as a vice-president. In 1933 he was made executive vice-president.

WILLIAM R. MITCHELL

MEETINGS

American Society of Mechanical Engineers. Semi-annual meeting, Hotel Pfister, Milwaukee, Wis., June 17–20.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 24–28.

Massachusetts Institute of Technology. Special summer conference on friction and surface finish, Cambridge, Mass., June 5–7.

Society of Automotive Engineers. Summer meeting, The Greenbrier, White Sulphur Springs, W. Va., June 9–14.

PLANT EXPANSION

Buick Motor Co., Flint, Mich., is constructing a 959x138-ft. addition to its axle plant.

Detroit Stamping Co., Highland Park, Mich., has begun construction of an entire new plant. Scheduled for completion early this summer, the building will contain approximately 35,000 sq.ft. of floor space and will represent an investment of some $80,000.

Kellett Autogiro Corp., Philadelphia, Pa., has acquired a four-story building at the municipal airport to take care of increased business.

Monarch Machine Tool Co., Sidney, Ohio, is planning a 20,000-sq.ft. addition to its plant, which will add approximately fifteen per cent to its capacity. Work on the new building, the sixth Monarch expansion in six years, is to start immediately. The company expects to be in full operation in the new addition within 60 days.

Monsanto Plastics Div. of Monsanto Chemical Co., Springfield, Mass., is planning a new plant to manufacture phenolic plastics. Work is to be completed early in 1941.

New Britain Machine Co., New Britain, Conn., is transferring machinery into a plant providing 30,000 sq.ft. additional manufacturing space.

Ranger Aircraft Engines Div. of Fairchild Engine & Airplane Corp., Farmingdale, N. Y., has awarded contract for the construction of additions to its administrative offices, manufacturing building and engine test cells. Expansion program is expected to be completed by Aug. 15.

United Cinephone Corp., Long Island City, N. Y., has moved its offices and plant to larger quarters in Torrington, Conn.

Westinghouse Electric & Mfg. Co. is planning a $500,000 expansion of its Mansfield refrigerator plant. Principal project is the construction of a three-story 70x360-ft. metal stamping building. Two stories will also be added to an 80x80-ft. building to increase the capacity of the wire goods department. The expansion program is expected to increase the plant's household refrigerator capacity by one third.

N. A. Woodward Co., Ferndale, Mich., aviation parts manufacturer, is constructing a 10,000-sq.ft. machine shop. Development will represent a total expenditure of about $50,000.

WASTE IS OBVIOUS HERE!

however...

IN THESE BEARINGS...

. . . hidden waste caused by poor lubrication increased the power costs 25% until TYCOL GREEN CAST GREASES revealed this loss . . .

To quote the plant superintendent: "The grease formerly used on our difficult bearing lubrication job would not withstand the moisture conditions encountered. It gummed up in the bearings —power costs jumped as much as $250 per month. » » » "On the recommendation of Tide Water engineers we changed to Tycol Green Cast Greases because of their superior lubricating properties, and their ability to resist the washing action of water. Bearings are now better lubricated and excessive power costs have been banished. And we were surprised and delighted to learn that 25% more cars may now be hauled per locomotive because of the reduction in frictional losses." » » » This operator, like hundreds of others using Tycol Green Cast Greases, gets better protection—more effective lubrication— per pound of grease. Here's the reason: Tycol Green Cast Greases are made from the finest cylinder oils available. A minimum of soap—a maximum of oil—is used. More lubricating oil per pound assures more economical lubrication. » » » Call the Tide Water representative or office for full details.

TIDE WATER ASSOCIATED OIL COMPANY

TIDE WATER DIVISION

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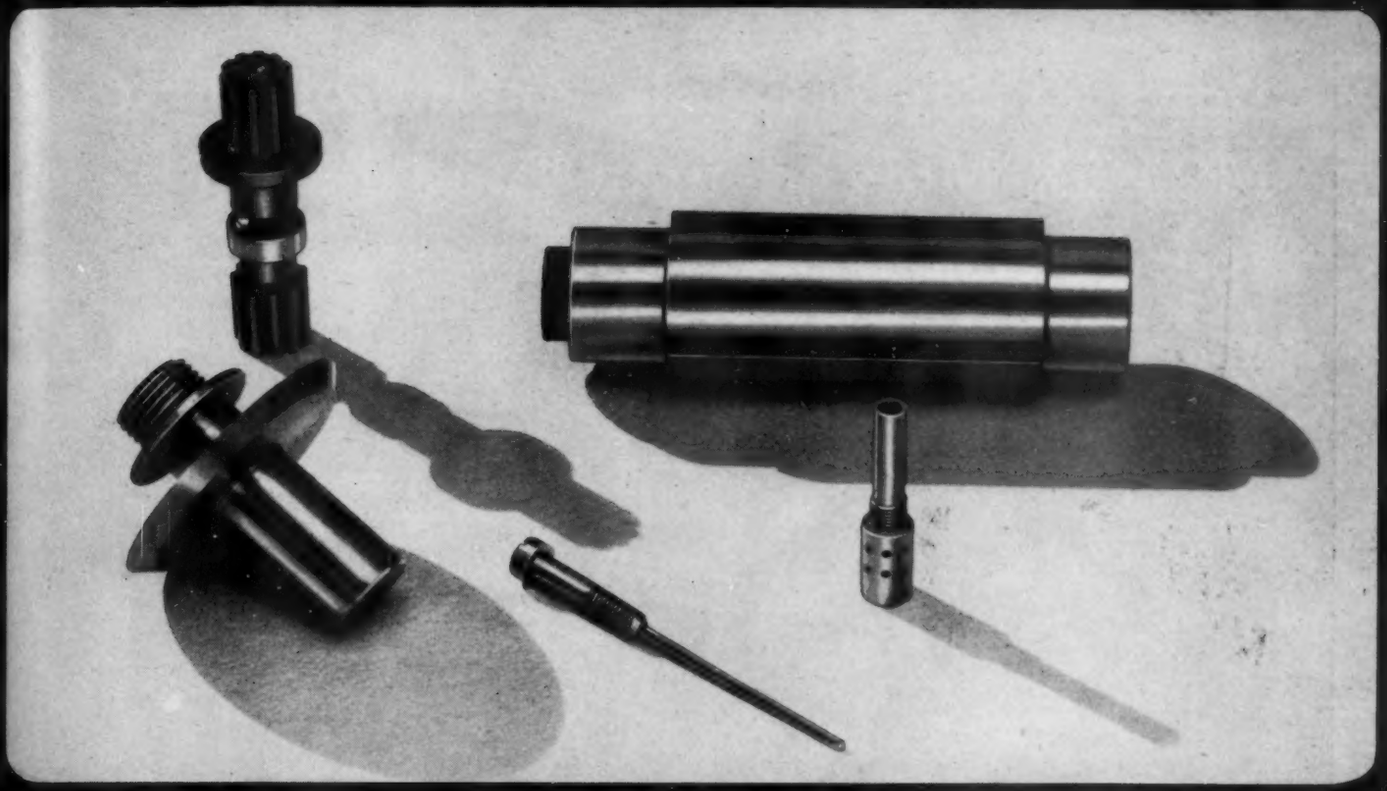
Regional Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N. C.

INDUSTRIAL TYCOL OILS-GREASES

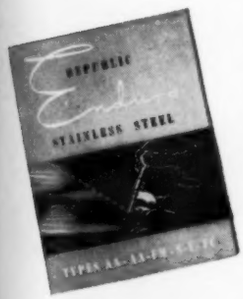
TIDE WATER GREEN CAST GREASES

THERE IS A COMPLETE LINE OF TYCOL LUBRICANTS SCIENTIFICALLY ENGINEERED FOR EVERY INDUSTRIAL USE



You, too, can machine *REPUBLIC ENDURO* Stainless Steel into stronger, longer-lasting parts . . . *AND DO IT FAST . . .*

• Manufacturers of equipment for use in dairies, canneries, beverage and chemical plants . . . makers of aircraft parts, scientific apparatus, tanks, oil heaters and refrigeration machinery . . . here is a stainless steel, Republic ENDURO* AA-FM, that will not slow up production when it reaches machining operations.



This alloy is a ductile, non-hardening stainless steel with physical properties equal to those of a high-grade medium carbon steel. It is highly resistant to corrosion and oxidation-resistant up to 1600° F. Yet its machining qualities rate 85-90%, compared with Bessemer screw stock.

It can be sawed, drilled, milled, turned, broached, tapped, threaded, ground and polished on production machines at speeds that do not boost costs.

A wealth of information on Republic ENDURO Stainless Steels is contained in Booklet 363—just off the press. The coupon below will bring your copy. Send it to Republic Steel Corporation, Alloy Steel Division, Massillon, Ohio; General Offices, Cleveland, Ohio.

REG. U. S. PAT. OFF.
REPUBLIC STEEL

BERGER MANUFACTURING DIVISION
NILES STEEL PRODUCTS DIVISION
STEEL AND TUBES DIVISION
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REPUBLIC ENDURO
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PLEASE SEND BOOKLET 363—

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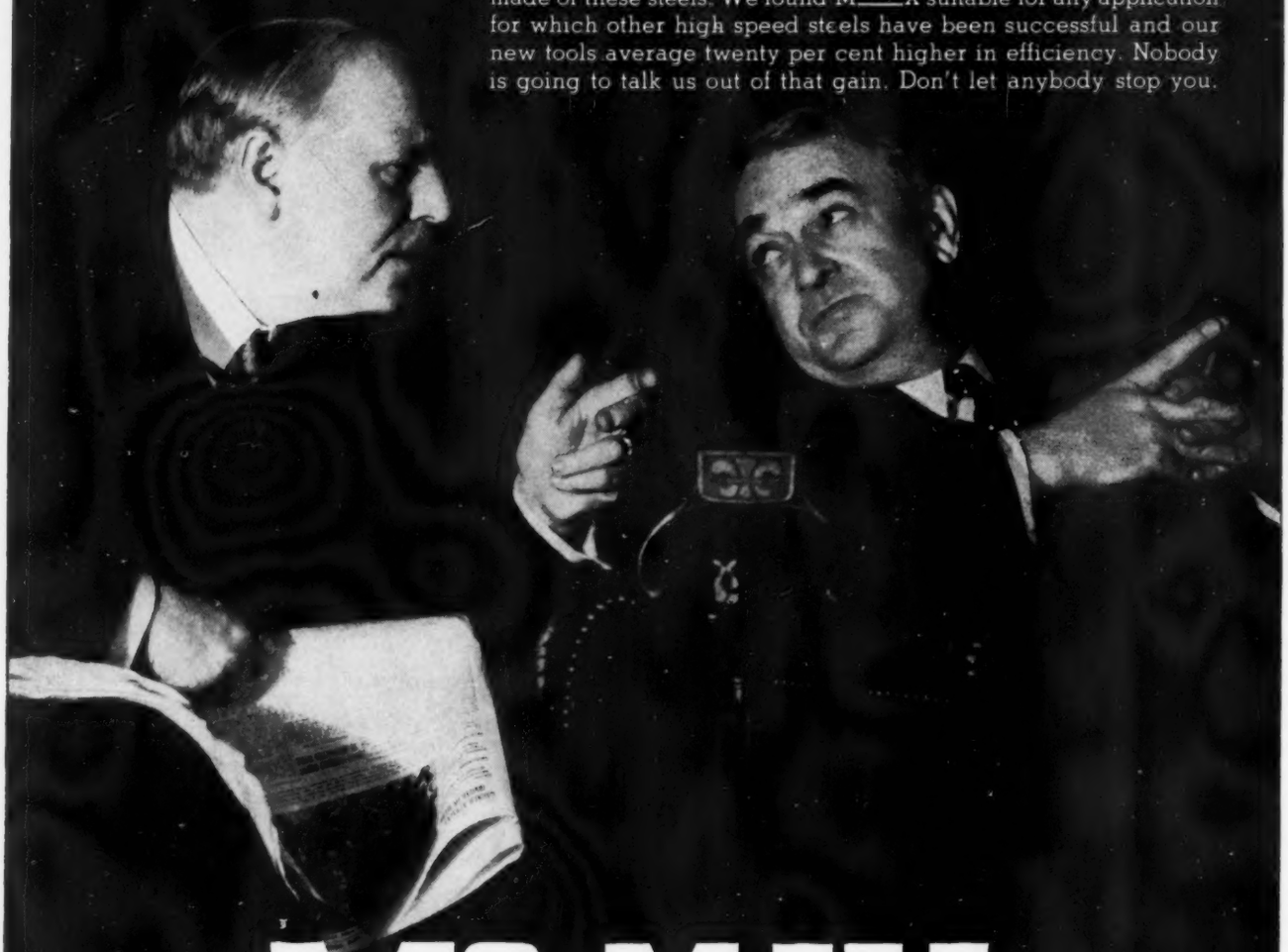
Don't let anybody talk you out of using MO-MAX Molybdenum Tungsten high speed steels.

WE thought we knew all about MO-MAX steels a long time before we began to use them. I regret the delay. One day our tool engineer had some of our pieceworkers supplied with MO-MAX bits. That settled it. With less time out for changing tools—cutting more metal between grinds—the pieceworkers and we both wanted more MO-MAX. Now nearly all our high speed tools are made of these steels. We found MO-MAX suitable for any application for which other high speed steels have been successful and our new tools average twenty per cent higher in efficiency. Nobody is going to talk us out of that gain. Don't let anybody stop you.



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TRADE MARK REG. U. S. PAT. OFF.

MOLYBDENUM-TUNGSTEN HIGH SPEED STEELS

Leading steel companies can supply you with their licensed brands of MO-MAX. For booklet with technical data and sources of supply, write The Cleveland Twist Drill Company, Cleveland, Ohio.

CD-218

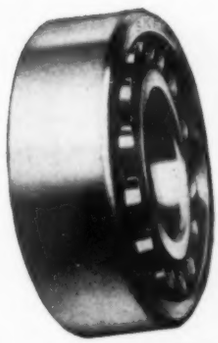
TURNING WHEELS *are Different* TODAY

They're **FASTER!**
They're **MORE ACCURATE!**
They're **STRONGER!**
They're **LIGHTER!**

A silver flash across the sky

A hurtling mass of steel across the land

A monster mill that rolls steel for Industry



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BEARINGS

ALL DEMAND MODERN BEARINGS

Turning wheels—all turning things—on the modern machine of today are so advanced in design that most machines of 20 years ago have long since been obsolete.

Modern machines of today present problems of SPEED that vary from 10 r.p.m. to 100,000 r.p.m. They present problems of LOAD that vary from the ability to sustain a feather's weight up to tremendous crushing stresses of thousands of tons. They present problems of both SPEED and LOAD that demand a *different* bearing type or size for each correct solution.

SKF makes more than 6000 bearing types and sizes . . . to meet the most exacting demands of modern rotating parts . . . to bring *new* power, maintenance and lubrication economies to modern plants . . . to match Industry's progressive strides in putting *more men* to work on *more machines*. Bring *your* plant and machines up-to-date with SKF Ball and Roller Bearings.

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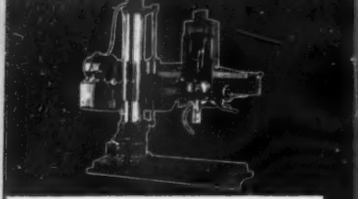
SKF INDUSTRIES, INC., PHILADELPHIA, PA.

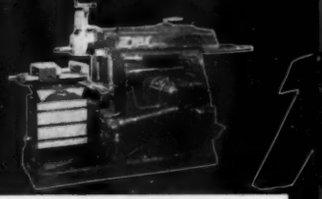


Fosdick Machine Tool Co.
(Radial Drill)

Panels, cylinders, and other hydraulic parts made of **Meehanite.**

Gear Grinding Mach. Co.
(Gear & Spline Shaft Grinder)

Meehanite used in head and tail stocks; wheel spindle column & head; wheel truing mechanisms; hydraulic parts.

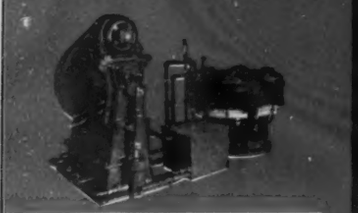


Gould & Eberhardt
(24" Universal Shaper)

Meehanite used at more than a dozen important places. Also used extensively on other machines.

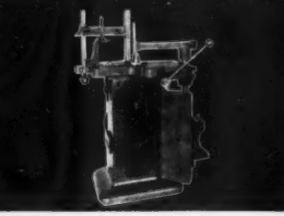
National Acme Co.
(Screw & Chucking Mach.)

Castings of **Meehanite** play a part in giving this Acme-Gridley Bar Automatic its extreme accuracy.



West Tire Setter Co.
(Shell Banding Press)

Meehanite selected for base pump, frame, and other hydraulic parts.



Davis Keyseater Co.
(Keyseaters)

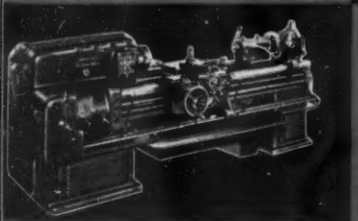
Bases and other important parts made of **Meehanite.**

Thompson Grinder Co.
(Surface Grinders)

All hydraulic valves made of **Meehanite.**

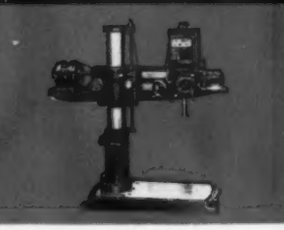
Cleveland Automatic Machine Co.
(Screw & Chucking Mach.)

The tool turret is made from **Meehanite** casting.



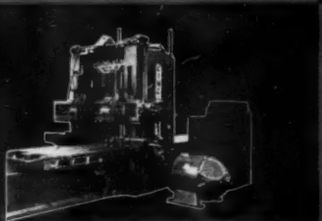
American Tool Wks. Co.
(Lathes & Radial Drills)

Considerable **Meehanite** used by this company throughout its entire line.



Cinci-Bickford Mach. Co.
(Radial Drill)

Meehanite castings used at several important points.



Cincinnati Planer Co.
(Double Housing Planer)

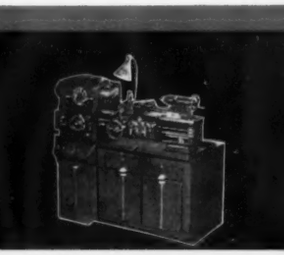
Meehanite used in tool blocks, clapper boxes, side head, rail clamps, measuring unit, etc.

National Machinery Co.
(Forging Machine)

The brake wheel on this machine is made of **Meehanite.**

The Oilgear Company
(Fluid Power Pump)

Hydraulically operated reversing plungers in combination control valve are of **Meehanite.**



Rivett Lathe & Grinder, Inc.
(Cabinet Laths)

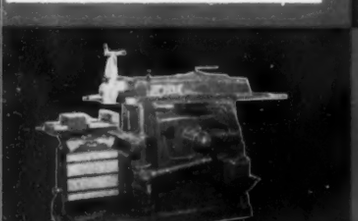
Large back gears are Meehanite, providing extreme quiet at top speed—200 ft./min.

National Broach & Mach. Co.
(Roto Mills)

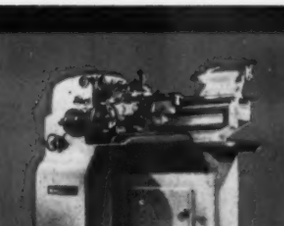
Meehanite selected for use at several points.

R. G. Haskins Co.
(Tapping Machines)

Air control valves made of **Meehanite.**

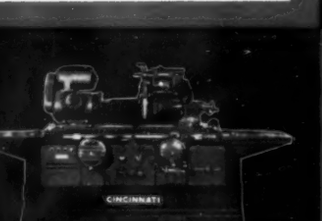


Gould & Eberhardt
(24" Uni
Mee



Monarch Mach. Tool Co.
(Lathes)

There are one or more applications of **Meehanite** castings in every Monarch Lathe.



Cinci. Milling Mach. Co.
(Dial Type Miller)

Meehanite is used in the above as well as in machines made by Cinci. Grinders, Inc.

Hardinge Brothers, Inc.
(Tool Room Lathe)

Face of apron made of **Meehanite.** Also used for locking ring in Hardinge milling machines.

THOUSANDS OF TONS OF

MEEHANITE CASTINGS

ARE USED BY THESE AND OTHER LEADING MACHINE TOOL BUILDERS

Automatic Machine Co.
(Screw & Chucking Mach.)

The tool turret is made from **Meehanite** casting.

Cincinnati Shaper Co.
(Shapers & Shears)

Meehanite used in six vital points in shaper (shown) and also in Cinci. Shear.

Farrell-Birmingham Co., Incorporated
(Roll Grinder)

There are 139 **Meehanite** castings in this machine, weighing approx. 192,200 lbs.

Kearney & Trecher Corp.
(Milling Machine)

Meehanite used in a number of bushings in above machine.

ACROSS THE BOARD

OF TODAY'S PROFIT-PROMOTING MACHINE TOOLS!

★ **MEEHANITE**
CASTINGS
Assure Greater Dependability At Vital Points

From the selection of materials better able to withstand the increased demands of heavier working loads and increased speeds springs the success with which machinery builders have been able to design greater efficiency and economy into today's machine tools. It is not surprising, therefore, that *Meehanite* . . . a scientifically processed cast iron with superior characteristics of uniformity and dependability . . . is being used more and more for vital parts where original alignment in dimensions during the entire working cycle is essential, and where greater resistance to wear, deflection, and vibration must be provided. Opposite are a few typical examples of leading machine tool builders who have found *Meehanite* indispensable in just such applications as these . . . your assurance that machines so equipped are inherently better able to serve the profit side of your ledger.

Make this move . . .

Perhaps there are vital points in the products you make where *Meehanite* might *also* be used to great advantage! At any rate, you should be fully acquainted with its superior qualities, so as to recognize the added value it imparts to any equipment you may buy. Send today for Bulletin No. 9, describing its engineering properties and illustrating typical machine tool applications.

● A new wheel chart of the physical properties of the engineering and special types of *Meehanite* castings has just been published. If you would like to have a copy, write us and we will gladly send you one.

MEEHANITE RESEARCH INSTITUTE
311 ROSS STREET · · · PITTSBURGH, PA.

There is a Meehanite Foundry near you!

Ansonia, Conn.	Farrel-Birmingham Co., Inc.
Bethayres, Pa.	H. W. Butterworth & Sons Co.
Bridgewater, Mass.	The Henry Perkins Co.
Buffalo, N. Y.	Pohlman Foundry Co., Inc.
Charleston, W. Va.	Kanawha Manufacturing Co.
Chattanooga, Tenn.	Ross-Meehan Foundries
Chicago, Ill.	Greenlee Foundry Company
Cincinnati, Ohio	Cincinnati Grinders Incorporated
Cincinnati, Ohio	The Cincinnati Milling Machine Co.
Cleveland, Ohio	Fulton Foundry & Machine Co.
Denver, Colo.	The Stearns-Roger Mfg. Co.
Detroit, Mich.	Atlas Foundry Co.
Flint, Mich.	General Foundry & Mfg. Company
Hamilton, Ohio	Hamilton Foundry & Machine Co.
Irvington, N. J.	Barnett Foundry & Machine Co.
Los Angeles, Calif.	Kinney Iron Works
Milwaukee, Wis.	Koehring Company
Mt. Vernon, Ohio, Grove City, Pa.	Cooper-Bessemer Corporation
New York, N. Y.	The American Brake Shoe & Foundry Co.
Oakland, Calif.	Vulcan Foundry Company
Orillia, Canada	E. Long, Ltd.
Philadelphia, Pa.	Florence Pipe Foundry & Machine Co., (R. D. Wood Company, Selling Agents)
Phillipsburg, N. J.	Warren Foundry & Pipe Corp.
Pittsburgh, Pa.	Meehanite Metal Corporation
Pittsburgh, Pa.	Rosedale Foundry & Machine Co.
Rochester, N. Y.	American Laundry Machinery Co.
Springfield, Mass.	Fleming Foundry Co.
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THE *Remedy* FOR "SHAFTWEAR"

"THE METAL THAT IS KIND TO THE SHAFT"

Every piece shows the size stamped from end to end on Bunting Tubular and Solid Bars. They are cast from SAE 660, a superior bearing bronze originated by Bunting and used by a majority of machinery manufacturers. Hundreds of sizes. Completely machined I.D., O.D. and ends. Your wholesaler can supply you . . . The Bunting Brass & Bronze Company, Toledo, Ohio . . . Warehouses in All Principal Cities.

Write for the Bunting 1940 Stock Catalog listing sizes and prices of Bunting Bars, Industrial and Electric Motor Bearings.

BUNTING

BRONZE BUSHINGS · BEARINGS
PRECISION BRONZE BARS · BABBITT METALS

The Human Side of Tools!

WHEN THE "HEAT'S" ON!

The front office says "Produce!" Produce better, faster, cheaper! That means the "heat" is on. It means tools—better tools—and quickly too! That is when you must reach for your phone with confidence, knowing that the supplier you're calling can and will give you *what* you need—*when* you need it.

In such situations, many leading manufacturers automatically call in "Illinois Tool." That kind of confidence is a trust, born of years of close association and helpfulness—a duty that our organization is trained to obey. Proper tooling is so important that in times of stress, it is well to remember that the human element can be an integral part of even cold steel.

H-I-G-H S-P-E-E-D ILLINITE PRODUCTION TOOLS

Milling Cutters . . . Ground Hobs . . . Broaches . . . Shaper Cutters . . . Ground Form Tools . . . Special Tools . . . Die Filing Machines . . . Gear Measuring Machines

OUR NEW CATALOG! Just off the press, our new 292-page Catalog E is filled with helpful information on metal-cutting tools. Available without charge to individuals making request on their company letterhead.

ILLINOIS TOOL WORKS

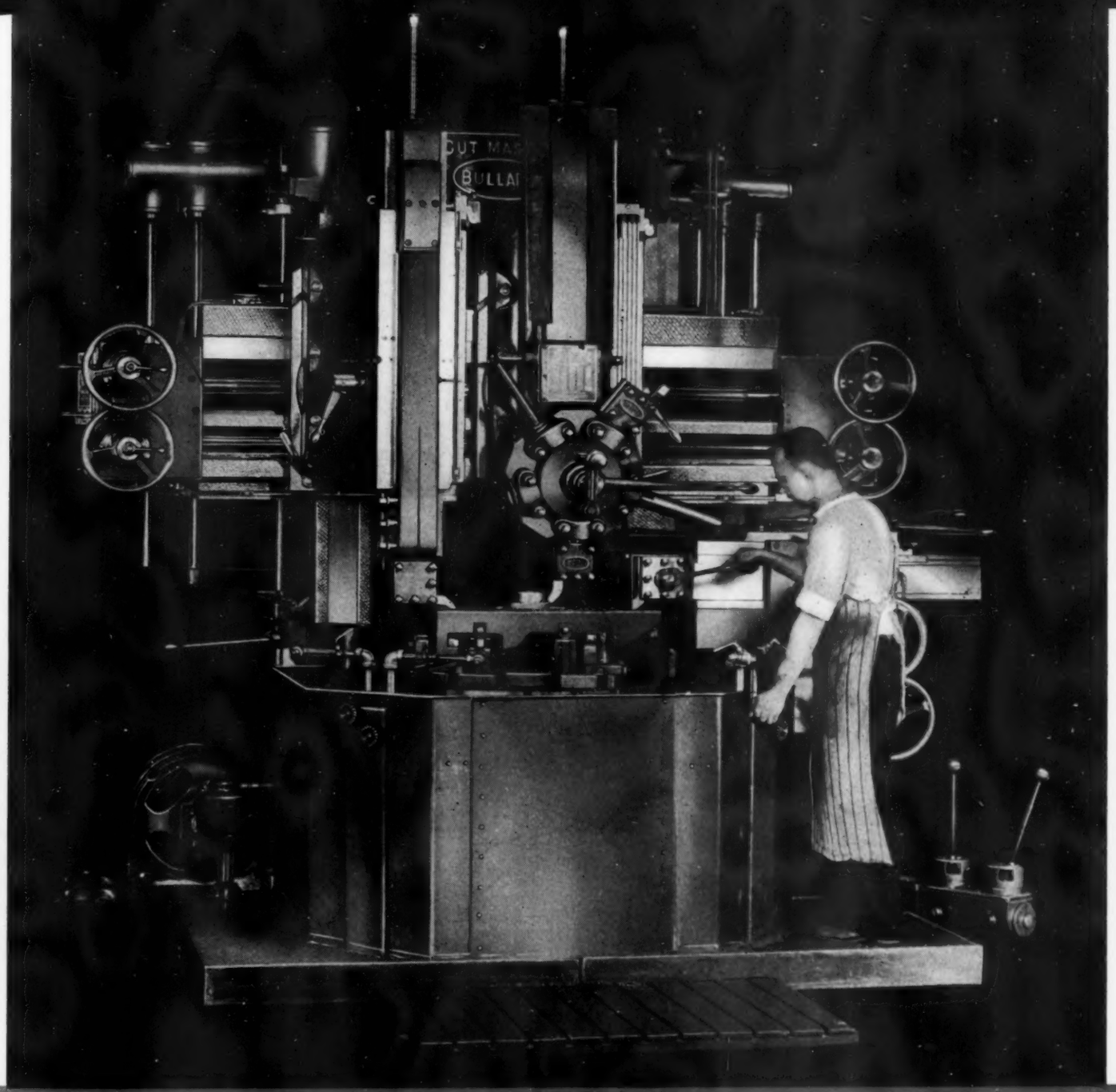
MANUFACTURERS OF HIGH SPEED PRODUCTION TOOLS AND SHAKEPROOF PRODUCTS

2501 N. KEELER AVENUE, CHICAGO, ILLINOIS • IN CANADA: CANADA ILLINOIS TOOLS, LTD TORONTO, ONTARIO

Copyright 1940, Illinois Tool Works

NAMES *that mean more than just machine tools . . .*

MULT AU MATIC



CUT MASTER

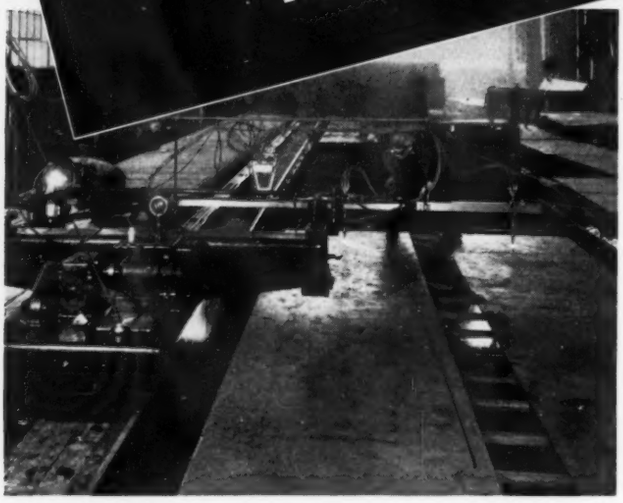
TO THE metal working industry "Mult-Au-Matic" has come to be as much the name of a manufacturing method as of a machine. And because this method—independent speeds, independent feeds, simultaneous operation—is available in a standard machine tool, which can easily be retooled as parts requirements alter, Mult-Au-Matics have become universally regarded as profitable long-time investments.

In similar manner the "Cut Master" Vertical Turret Lathe is recognized as setting up new standards of accuracy, production and economy within its particular field.

These two types of machines, in their different sizes, cover a wide range of manufacturing requirements, and permit Bullard Engineers to develop lower cost production figures on a tremendous number of jobs.

THE BULLARD COMPANY
BRIDGEPORT **CONNECTICUT**

Two Essential Steps



Three views of the Airco No. 20 Travograph showing the extremely wide areas over which this machine can operate.

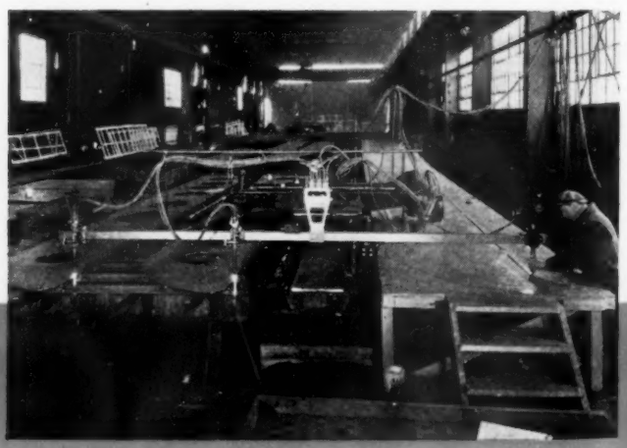
The first step—Machine Gas Cutting

Products welded from machine gas cut parts are strong and rugged—yet light in weight. Machine gas cutting speeds up production and lowers costs all down the line...a boon both to manufacturer and to consumer. » » » Where quantities of parts are required — whether large or small — the proper machine from Airco's complete line makes welded construction more profitable. Users of Airco Gas Cutting Machines are assured of the most efficient results because they benefit from the practical assistance of members of our Applied Engineering Department. Write for full details.

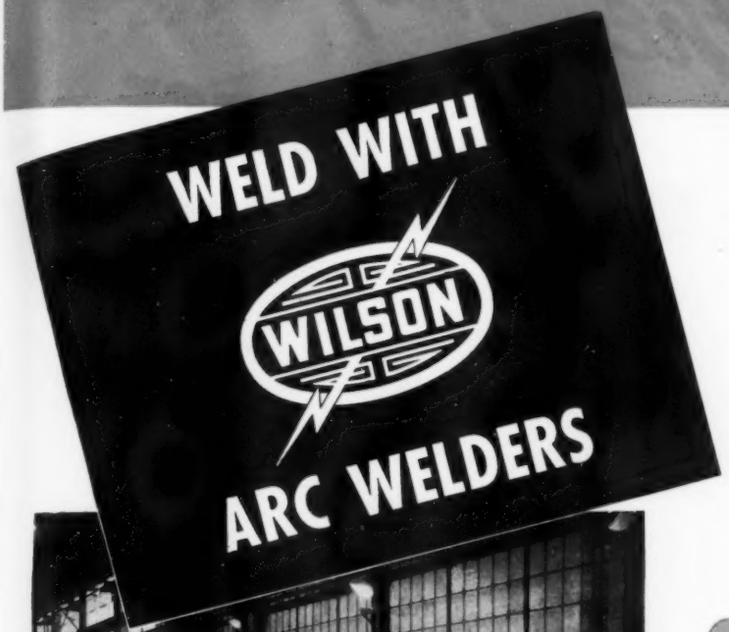
AIR REDUCTION

GENERAL OFFICES: 60 EAST 42ND ST., NEW YORK, N. Y.

DISTRICT OFFICES IN PRINCIPAL CITIES



TO COST-SAVING MODERN FABRICATION



Here several Wilson "Hornets" — newest of the line of electric welders that make the arc behave — are being used to fabricate garbage disposal trucks for the City of New York.*

The second step—Arc Welding

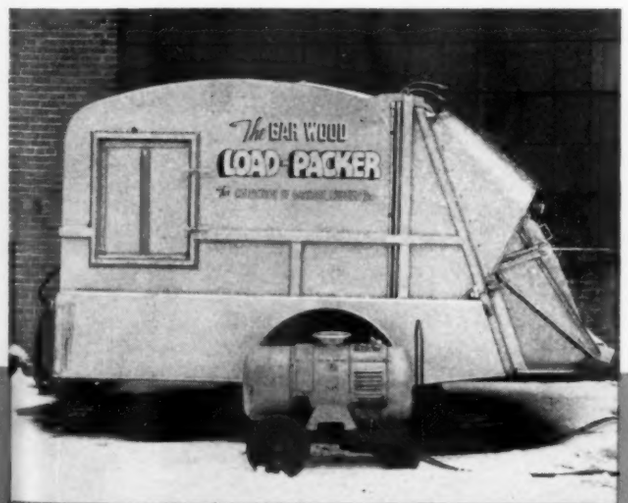
Speed in application, excellent performance, soundness of quality — that's the kind of welding you get when you use Wilson Arc Welders and Welding Electrodes.

Wilson Welders — our line includes types for every arc welding need — establish an arc of just the right character for any particular job. It is the inherent ability of Wilson machines to maintain a stable, uniform heat-generating arc that makes welding easier and assures better results at lower costs. Write for full details.

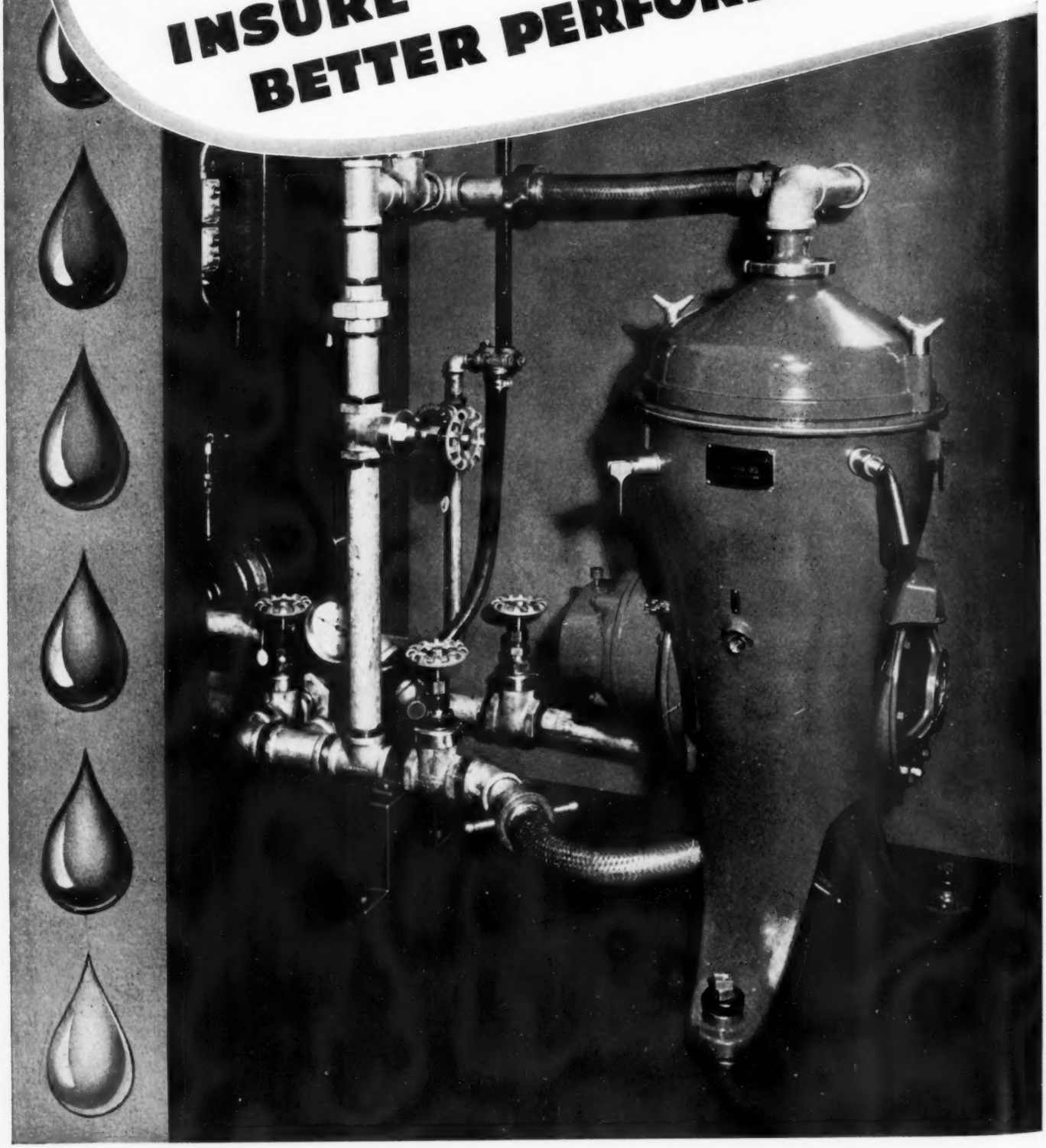
WILSON WELDER & METALS COMPANY, INC.

***General Offices:* 60 East 42nd Street, New York, N.Y.**

*Trade-Mark Reg. U. S. Pat. Off.



CLEANER GRINDING COOLANTS *in the Shop* — INSURE BETTER PERFORMANCE...



...in the Air

... and so this leading airplane engine builder uses the

DE LAVAL Clarification System

to obtain better working surfaces

The illustration on the opposite page shows a De Laval "Air-Tight" Coolant Clarifier in the plant of a leading airplane engine builder. This machine employs centrifugal force to continuously remove from the coolant even the tiniest particles of metal and abrasive.

Removal of such material from coolants with the De Laval Coolant Clarifier enables grinding to closer limits, results in finer finish, makes possible the use of softer wheels and prolongs wheel life. Obviously, the De Laval System enables coolant to be used over and over again without becoming charged with impurities and materially reduces the hazard of infection among workmen.

More efficient extraction and purification of cutting oil

Worthwhile savings in cutting oil can be realized by employing the De Laval Extractor to more completely extract the oil from chips and turnings; longer tool life and higher permissible cutting speeds are possible by purifying the oil by means of a De Laval Oil Purifier. By constantly returning purified oil to the system, all of the oil in service is maintained in cleaner condition with beneficial results.

Purification of washing and slushing oils safeguards product, lowers costs

The De Laval System provides a low cost means of purifying washing and slushing oils by removing impurities picked up during the processes. Oil in continuous systems is used over and over again at full efficiency. Oil used in coating of parts before packing is rendered moisture and dirt free, insuring protection against rust and dangerous abrasive particles.

Block tests are safer, less costly when oil is purified

The De Laval Oil Purifier provides an efficient means of continuously removing metallic particles, grit and water from lubricating oils in circulating oil systems. Purification of automobile engine block test oil—a typical application of this system—results in cleaner motors, fewer rejections and oil savings. It has also been found that when oil is continuously purified, motors can be safely assembled into cars without removing the oil pans after testing—an important time-saving feature.

Other services and savings to metal working industries

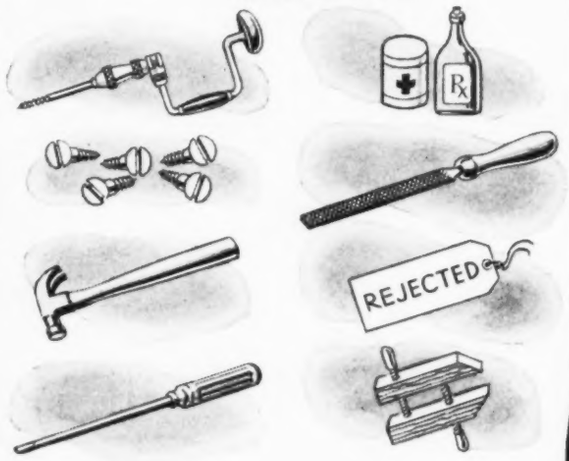
De Laval Centrifugal Equipment is available for removing solid matter from honing oils, purifying hydraulic press oil, quenching and tempering oils as well as liquid coolants and seals involved in such operations as rolling, drawing, cooling, compressing and exhausting. You are invited to submit your problem to De Laval engineers with the assurance that you will benefit by their wide experience.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York **427 Randolph St., Chicago**
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco
THE DE LAVAL COMPANY, Limited
Montreal Peterborough Winnipeg Vancouver

DE LAVAL
COOLANT CLARIFIERS

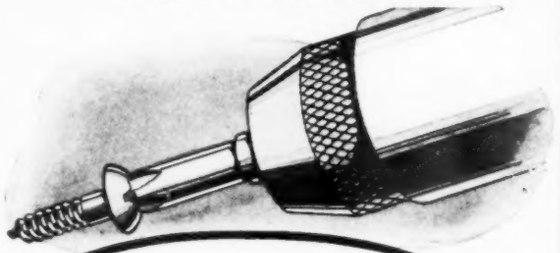
HERE'S YOUR EVIDENCE

WHY DRIVING OLD-FASHIONED SCREWS WASTES TIME.



Twice as many hands are needed with old-fashioned screw driving as with **PHILLIPS RECESSED HEAD SCREW** *shown at right.*

WHY PHILLIPS SCREWS SAVE AN AVERAGE OF 50% IN ASSEMBLY TIME.



Every item pictured left represents unnecessarily wasted time — hours which *can* be saved using Phillips Screws.

Phillips Screws shorten hours spent in screw driving, and speed delivery of your products by eliminating:

need for drilling pilot holes
need for a helper to steady the work
slow driving with hand drivers
crooked screws or split heads
accidents caused by slipping drivers
delays caused by broken drivers
refinishing screw driver scars

The Phillips Screw clings to the driver, permitting one-hand driving while the other hand holds the work. The recess prevents the driver from slipping, so it's safe to use a faster driving method. Fewer screws (or smaller, lower-cost sizes) can be used because the Phillips Screw provides greater holding power.

The reason you see Phillips Screws on most makes of cars, aircraft, electrical appliances, furniture, etc. — is that those manufacturers have proved it costs less — in time and money — to use Phillips Screws. Don't let slow-poke fastening cause an unnecessary jam of unfilled orders. Get in touch with one of the firms listed below.

PHILLIPS RECESSED HEAD SCREWS...

MACHINE SCREWS · SHEET METAL SCREWS · WOOD SCREWS · STOVE BOLTS

U. S. Patents on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338. Other Domestic and Foreign Patents Allowed and Pending.

Speed Product Deliveries by Cutting Assembly Time

American Screw Co., Licensee, Providence, R.I.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corporation, New Britain, Conn.
The Lamson & Sessions Co., Cleveland, Ohio
National Screw & Mfg. Co., Cleveland, Ohio
Parker-Kalon Corporation, New York, N.Y.
Pheoll Manufacturing Company, Chicago, Illinois
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Lock Washer Co., Chicago, Ill.

In the production of these **BARREL FERRULES**

WYCKOFF

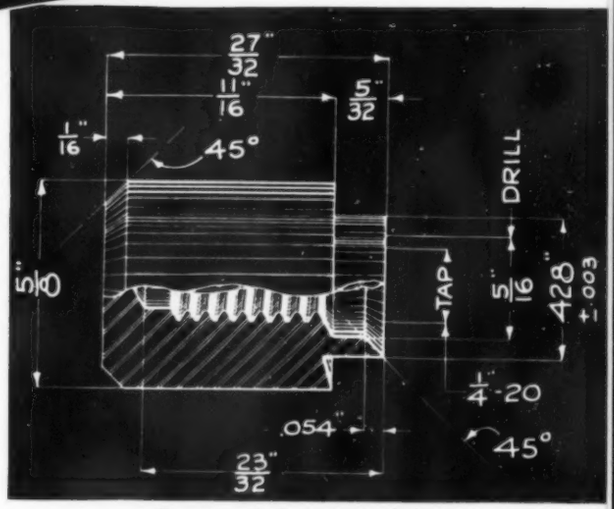
BESSEMER S.A.E. X1112 LEADED STEEL

RAN 9 HOURS AND 20 MINUTES AT 2333 R.P.M. WITH .0082 FEED *BEFORE REGRINDING*

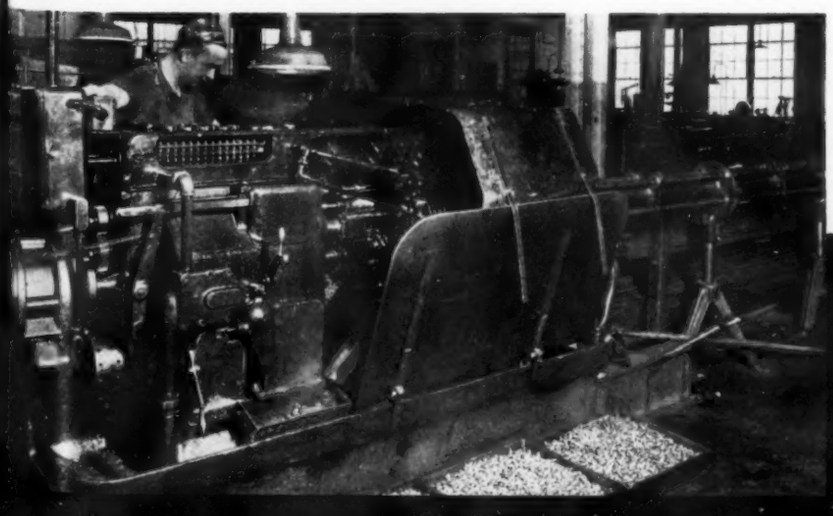
BEST previous performance with other standard S.A.E. X1112 Bessemer Screw stocks was 3 hours and 13 minutes at 1906 R. P. M. before the entire tool setup required grinding.

And this is not an isolated case—it is typical of the service Wyckoff Bessemer Leaded Steels are rendering screw machine products manufacturers wherever applied.

We will welcome the opportunity of demonstrating Wyckoff Leaded Steels in *your* plant on some of your difficult parts problems.



Sectional drawing of the Barrel Ferrules



Multiple Spindle Automatic Screw Machine used in producing these ferrules.

COLD FINISHED STEEL
WYCKOFF

WYCKOFF DRAWN STEEL COMPANY

FIRST NATIONAL BANK BLDG., PITTSBURGH, PA.

3200 SO. KEDZIE AVENUE · CHICAGO, ILL.

Mills at Ambridge, Pa. and Chicago, Ill. . . . Warehouse Stocks in Principal Cities . . . Manufacturers of Carbon and Alloy Steels . . . Leaded Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2"

LOCATING GEAR TROUBLES

ars are not a matter of They are the result of he right kinds of steels, to accurate production correct heat treat- and good or what has made it unsatisfactory. When gears are found coming through which are not satisfactory for service, an analysis should be made to deter reasons therefor. For thi accurate gear analysis equ and should fo

GEAR FINISHING

CROSSED AXIS SHAVING

Rack Method

vent of crossed axis en the practice to gear blanks by a peration wherein nd the gear blank l relation to each

gan Tool Company solved the p lem. In crossed-axis shaving teeth are finished by gear relative cutter

CURVE SHAVING

RS, particularly when

OF TOOTH BREAKAGE d concentration at tooth ularly in high helix an-

DRIVE SIDE

COAST SIDE

LEAD CHART AT PI

Fig. 17. Typical lead chart of gear taken along the pitch line the chart represents .0001 (ce higher than ends).

LAPPING HINTS

the bearing desired th of two mating Fig. 1. It consists n the face of the

bearing will insure quietness unde such conditions. It may be obtained by setting one lap "plus" on a Michigan 3-lap Lapper, and one "minus", leaving the third l the correct setting. Ad spindles are requ type of be

arallel

"SINE-LINE" CHECKING

rious of course that r checking depends on the checking equipment e of operation. Simple s are preferable to chang- diameter master

tion. It may be used equally tively for checking large numbers of gears of the same characteristics or small numbers of gears of widely varying design.

In connection with the latter, an dvantage of "Sine-Line" equip- does not require

Michigan Tool Company
7171 E. McNichols Road, Detroit

Please send me a copy of "BETTER GEARS"

Name_____

Title_____

Company_____

Address_____

. . . and (if you have a gear Problem)

We are interested in_____

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"Full Range" Service symbolizes what Crucible offers you with its complete line . . . all grades and types of Specialty Steels. Crucible's 26 Branches and Warehouses in every important industrial area enable you to centralize and simplify your Specialty Steel buying from a single, dependable source. Your practical Crucible Steelman . . . backed by specialists . . . can save you time, money and needless experiments. "Call on Crucible" for "Full Range" Specialty Steel Service.

CRUCIBLE STEEL COMPANY of America

Specialty Steelsmiths to INDUSTRY

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BRANCHES, WAREHOUSES AND DISTRIBUTORS IN PRINCIPAL CITIES

CONSULT TELEPHONE DIRECTORY OR THOMAS' REGISTER FOR NEAREST OFFICE

IF IT'S *Speed* YOU WANT...

Professional skaters recommend these Aluminum rollers used on "Chicago" skates. They hold to the floor and they're long-lived.

Free-cutting Alcoa Aluminum, used for these rollers, permits high speed machining. Screw machine operators like to work with this stock. Chips are small. There are no long curls to foul tools and slow down the work.

In analyzing costs of screw machine products, remember this: You get three times the number of Aluminum pieces per pound, compared with the heavy metals. Your machining costs are low. Finishes are bright and smooth, in many cases requiring no further operations. Expensive plated coatings are not necessary.

Free-cutting Alcoa Aluminum screw machine stock is carried in all standard sizes at conveniently located warehouses. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh, Pennsylvania.

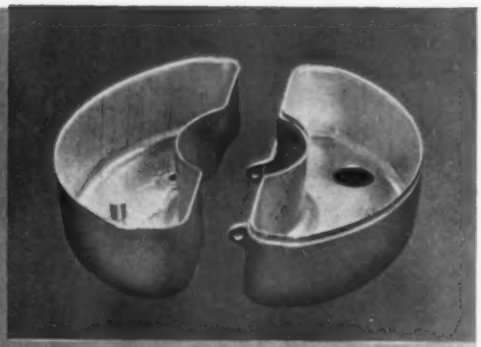
IT IS THRIFTY TO USE ALCOA ALUMINUM WISELY

ALCOA ALUMINUM

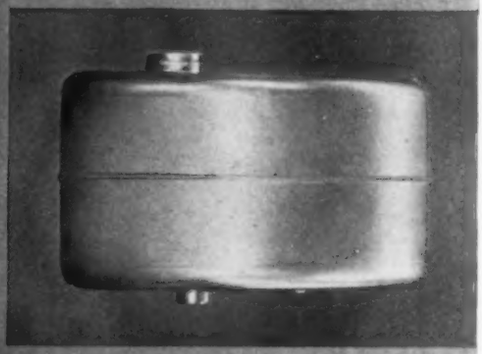
Assembly of outboard-engine gasoline tanks by brazing at Johnson Motors' plant, Waukegan, Ill.

You asked for this information on

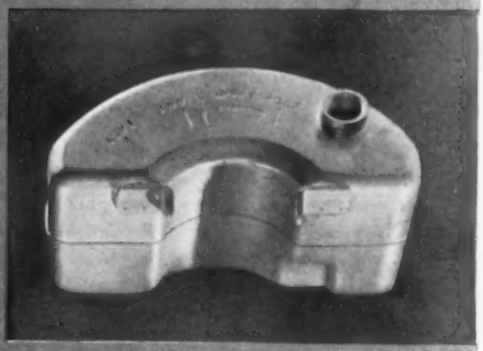
BRAZING ALUMINUM



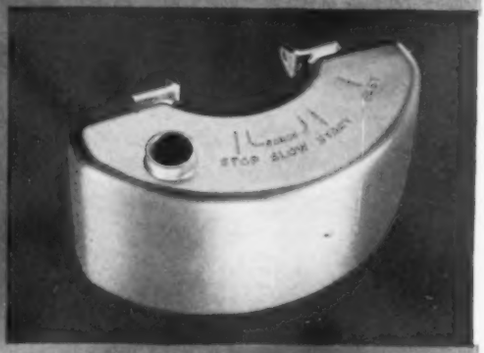
Fittings in place and tank halves ready for assembly.



Parts set together, flux and filler material added, and the tank is ready for brazing.



Assembly of tank and fittings is completed. Joints are gas-tight and strong.



Ground down and finished, the joint has a smooth surface.

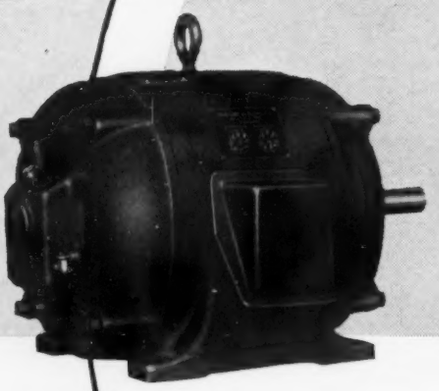
Here you see, pictured step by step, the progressive operations in a highly successful batch-brazing job. Many thousands of these Aluminum tanks have been brazed, at costs substantially lower than for the tanks previously fabricated by gas welding.

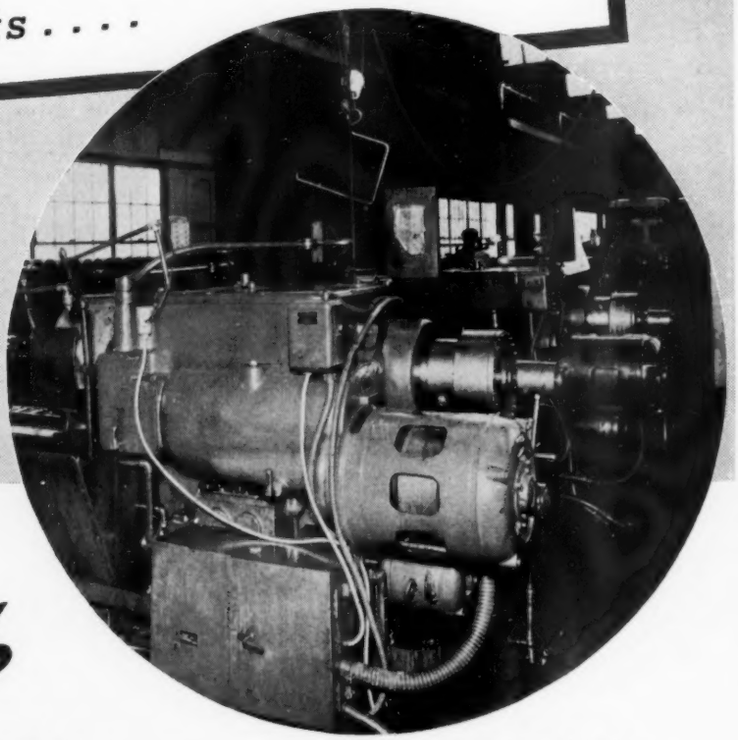
The brazing of Aluminum Alloys is a very recent development. Only a relatively small number of applications have been carried to the production stage. The process is best suited to the assembly of light-gauge parts, where gas or arc welding would be impossible; such parts as refrigerator evaporator units, cooling plates, finned coil diffusers, trays, radiators, carburetor floats and the like.

If you have a product that is similar in character to these, and which you think meets these qualifications, we'll gladly help you determine the possibility of fabricating it by brazing. ALUMINUM COMPANY OF AMERICA, 2193 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

For More Accurate Production Control, Greater Flexibility and Lower Production Costs....





The Century

Multispeed Motor

Each lathe in the foreground is equipped with a Century Multispeed 20-10 horsepower and a 2 horsepower Single Speed Motor, in a shop demanding a wide range of precision work.

Do any of your machines require more than one speed for efficient operation? Would a second, third or fourth speed increase production or accuracy through greater flexibility?

If so it will pay you to investigate the advantages offered by Century Multispeed Squirrel Cage Induction Motors — providing as many as four different speeds at the touch of a button.

Such speed changes make possible a greater variety of cutting speeds, frequently a more exacting use of alloy cutting steels, and result in d-finite operating advantages and production economies.

In addition, the exceptional balance and remarkable freedom from vibration of Century Motors increases machine tool accuracy. Surface waves on the work are reduced, tolerances can be more closely controlled and the percentage of rejected pieces lowered.

Century Multispeed Motors are available in wide or narrow speed ranges—open, splash-proof or enclosed fan-cooled types furnished in all popular ratings.

Your nearest Century Motor Specialist will gladly tell you how Century Motors may save you money, speed up machine tool work and lower production costs. The long experience of our representatives is always at your service. Call or write today.

CENTURY ELECTRIC CO.

1806 Pine Street, St. Louis, Missouri

Offices and Stock Points in Principal Cities.

Century MOTORS

One of the Largest Exclusive Motor Manufacturers in the World

PRODUCTION *and* ACCURACY *Plus!*

XLO

Ex-Cell-O builds seven different styles of Precision Thread Grinders. They range from a simple production machine to the more elaborate automatic universal machine—machines that handle extremely short or very long pieces, pieces with external or internal threads.

Below is shown Style No. 31. Use coupon below to obtain information on complete line.

There's only one standard of accuracy when it comes to making parts for aircraft engines . . . engines that must carry aloft safely and surely the huge transports serving the air travelling public of America. . . . *This standard is the maximum precision that it is possible to attain.*

This is why Ex-Cell-O Precision Thread Grinding Machines are entering more and more into the aircraft industry, solving close-limit production problems in a profitable way. . . . The airplane engine parts shown above are all precision ground from solid, hardened blanks on Ex-Cell-O Precision Thread Grinders without any sacrifice of production or increase in cost over less accurate threading methods formerly used. Not only is a better finish now obtained, but experience has conclusively proved that service failures are reduced with the precision grinding of these threaded parts. . . . No matter what your threading job may be, the installation of an Ex-Cell-O Precision Thread Grinder in your shop is a direct step to more and better threaded work at less cost. Send to Ex-Cell-O today for a new folder on Precision Thread Grinding. Ask for Bulletin No. 48201.

EX-CELL-O CORPORATION • 1224 OAKMAN BLVD. • DETROIT, MICH.

EX-CELL-O *Precision* MACHINES AND TOOLS

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Please send me Bulletin No. 48201 on Precision Thread Grinding.

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Company _____

Address _____

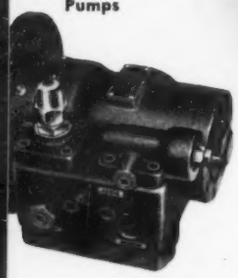
FOR PROFIT'S SAKE

Modern Machine Tools are Equipped with

VICKERS

HYDROMOTIVE CONTROLS

Two-pressure Pumps

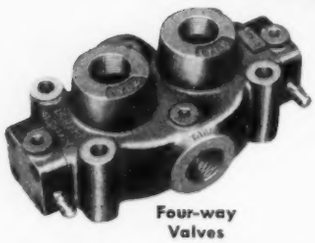


Variable Speed Transmissions

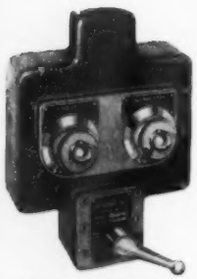
Vickers supplies the correct answer to troublesome control and drive problems. By replacing old methods with modern VICKERS equipment you can be assured of achieving your objective in modernization—*INCREASED PRODUCTION AND LOWER COSTS.*

Ask Vickers engineers to help you with your job of selecting the equipment best adapted to your requirements.

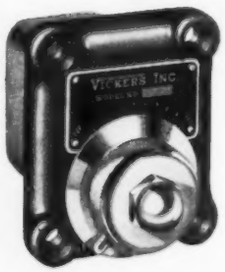
Fluid Motors



Four-way Valves

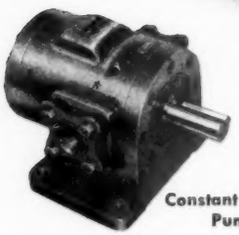


Traverse & Feed Panels

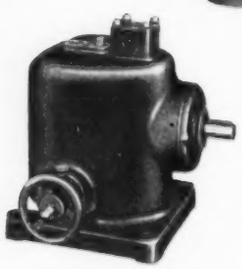


Flow Control Valves

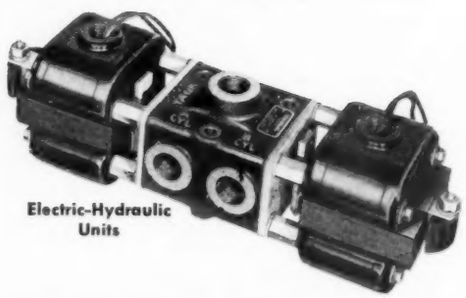
Pressure Controls



Constant Delivery Pumps



Variable Delivery Pumps



Electric-Hydraulic Units

VICKERS

TYPICAL MODERN PROFITABLE APPLICATIONS OF VICKERS EQUIPMENT

MACHINE TOOLS—"Feed and traverse" cycles, reciprocating cycles, indexing drives, spindle drives, unit head installations, clamping and chucking, clutch control.

SPECIAL PURPOSE AUTOMATIC MACHINERY—Applications so varied that each is a hydraulic control problem entirely its own, utilizing standardized Vickers Controls of all types.

PLASTIC INJECTION AND DIE CASTING MACHINERY—Controls for die operation and material injection . . . either manual or automatic cycles with safety interlock features.

PRINTING MACHINERY—Tension and impression controls, matrix press operation, variable speed press drives, handling equipment.

HYDRAULIC PRESSES—Controls for forming, coining, drawing, piercing, riveting, straightening and bending operations . . . variable and constant delivery high pressure installations for small or large work.

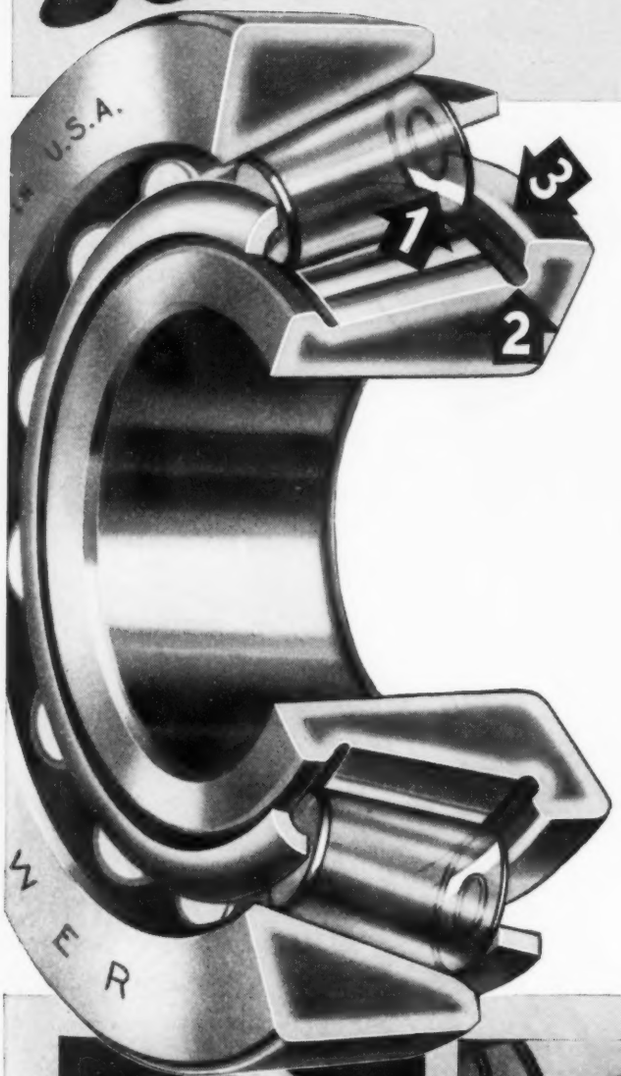
STEEL MILL EQUIPMENT—Hydraulic furnace pushers, stock handling equipment, roll balancing and forging manipulator controls.

WELDERS—Work clamping, and operation of spot, projection, butt and seam welding cycles.

AVIATION CONTROL DEVICES—Light weight pumps, fluid motors and hydraulic control units for varied aeronautical applications.

Incorporated • 1410 OAKMAN BLVD. • DETROIT, MICH.

LOOK AT ALL 3



THERE are three points in Bower design that builders and users of bearing-equipped machinery can well afford to study.

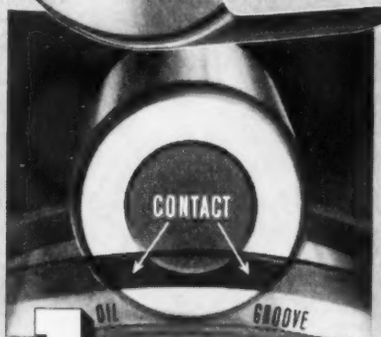
All three are features of flange design and all three are exclusive to Bower, particularly in the extent to which they carry advanced engineering and the degree in which they improve results in practical operation.

Working together, they strike at the most dangerous enemy of tapered roller bearing operation —*wear-back* of roll heads. In so doing, they not only contribute tremendously to the life of the entire bearing, but also effectively solve the problem of adjustment.

It is now possible to permanently adjust a Bower Tapered Roller Bearing at the time of installation, so that wearing-in, running-in and "final adjustment" are entirely eliminated.

More detailed information is to be found in a folder, entitled "Secrets of Bower Design and Quality," which you may have on request.

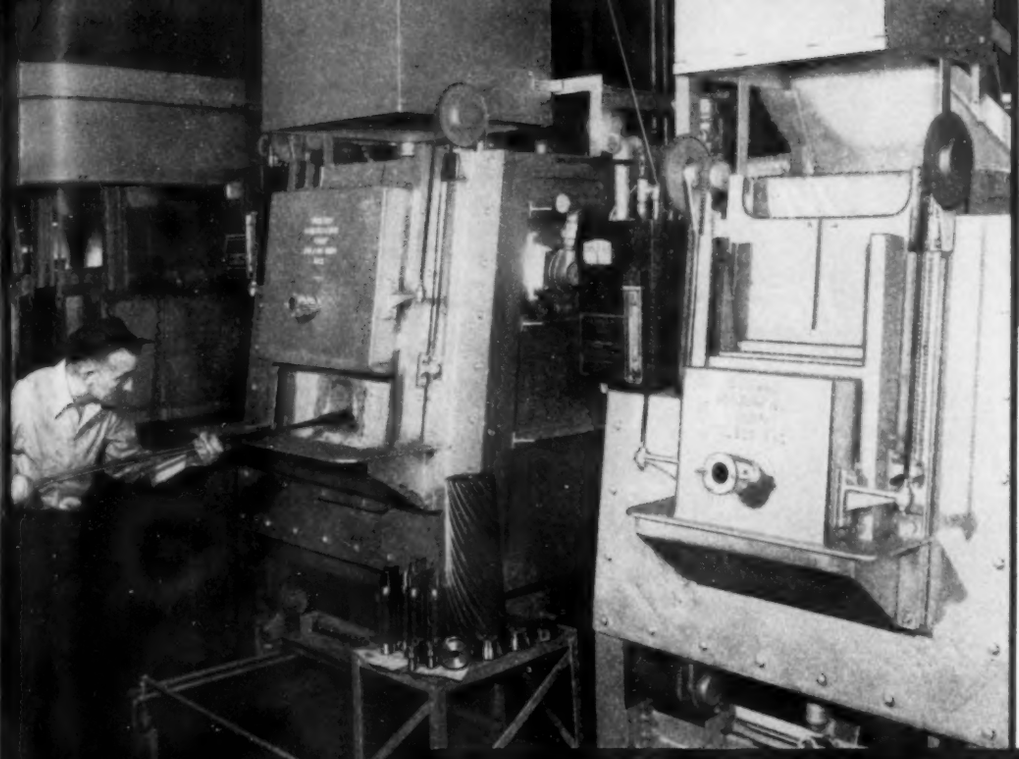
BOWER
ROLLER BEARING CO.
Detroit, Michigan

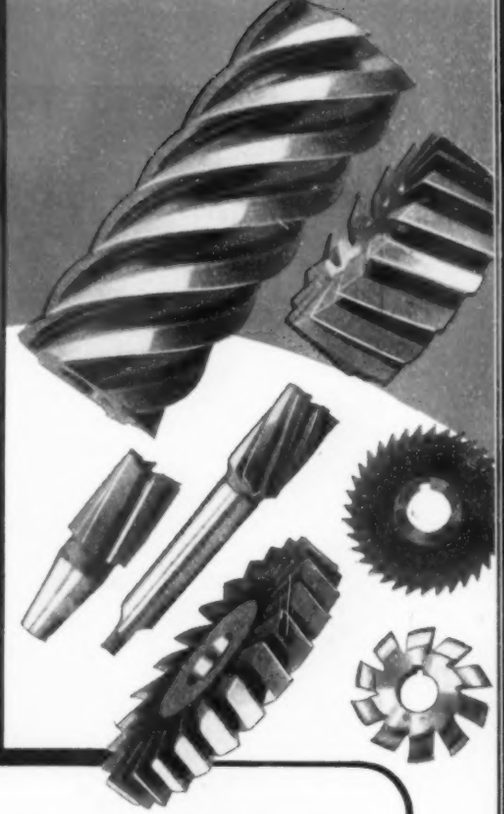


1 **TWO-ZONE CONTACT:** Provides wider base for squaring-up roll head, insuring rigid alignment. Gives larger area of contact surface, reducing wear by reducing unit pressure.

2 **LIBERAL OIL GROOVE:** Insures against excessive wear-back of roll head by supplying an abundant, constant supply of lubricant which the roll picks up as it turns.

3 **GROUND RADIUS:** Prevents chipping and noise by allowing roll head to enter smoothly into contact. Bower's special finish of bearing surfaces further prevents wear of parts.





AN OVERCOAT OF ATMOSPHERE PROTECTS THE CARBON IN THE PIECE

Completely dispensing with all protective coatings other than that supplied by the atmosphere itself, SC Char-Mo furnaces have proved their ability to heat treat the complete range of steels—from straight carbon to high speed molybdenum alloys without decarburization, within a temperature range of 1400° to 2400° F.

Air passed through hot charcoal produces an atmosphere, consisting largely of nitrogen and carbon oxides, which is so low in hydro-carbons, hydrogen and water vapor that their effect is completely negligible. Economy and speed are obtained by burners that heat both the muffle and the atmosphere generator, automatically balancing the carbon oxide equilibrium at *any* predetermined temperature and eliminating the adjustment of atmospheres for different steels.

Char-Mo furnaces were originally developed for molybdenum steels to combat their high decarburization tendency. But, today with the low operating costs developed, plus the exceptionally inert Char-Mo atmosphere, all types of steels are being handled successfully.

If you are heat treating tool steels now, send a few sample pieces to be treated to your specification. You'll be pleased with the high order of the results and surprised perhaps at the low cost which can be accurately determined in advance. Write today for additional information on the Char-Mo or other SC Heat Treating Furnaces.

SURFACE COMBUSTION CORPORATION, TOLEDO, O.

WHEREVER HEAT IS USED IN INDUSTRY

SC 33 YEARS

SURFACE COMBUSTION

MANUFACTURERS OF INDUSTRIAL FURNACES · JANITROL GAS-FIRED SPACE HEATING EQUIPMENT · AND KATHABAR AIR CONDITIONING SYSTEMS

For Example—

Refrigerator Parts

• Forged Steel Refrigerator Compressor Connecting Rods .625" diameter x 5/16" long—Microfinished in one operation, removing from .0005" to .0007" stock from ground surface in 7 seconds. Accuracy generated within .0001" to .00015" limits; surface finish within 3 microinches r.m.s.

Agricultural Implements

• Steel Hydraulic Pump Valve Bushing, .593" diameter x 1 21/32" long, 68 Rockwell C. Microfinish honed in one operation, removing .0005" to .001" stock from ground surface in 22 seconds. The operation generates accuracy within .0001" for round and straight; and surface finish within 2 to 3 microinches r.m.s.

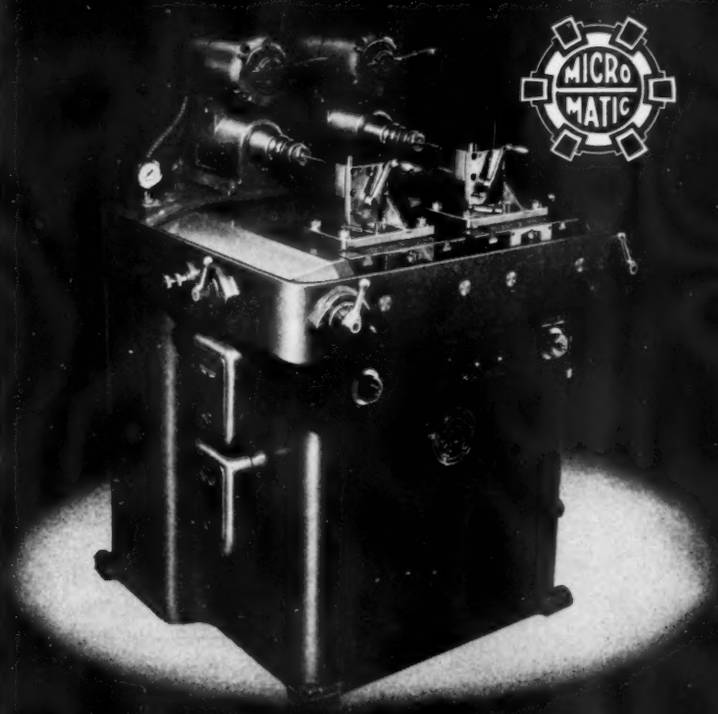
Aircraft Parts

• Steel Valve Tappet Guides (Airplane Engine) .688" diameter x 2½" long, and .814" diameter by 3¼" long, are Microfinished in two operations, removing a total of .0005" to .0015" stock from ground surface in approximately 50 to 60 seconds. Accuracy within .0003" to .0005" limits for round and straight is generated. Surface finish is from 1 to 2 microinches r.m.s.

Automotive Parts

• External Surface on Universal Joint Rear Yoke, 1¾" diameter x 2⅞" long is microfinished in one operation, removing from .0005" to .0008" stock in 15 seconds, producing 4 pieces per minute on two spindles. Accuracy generated within .0002" for round, .0005" for straight. Surface finish within 4 microinches r.m.s.

Microfinish with the *New* MICROMATIC HYDROHONER



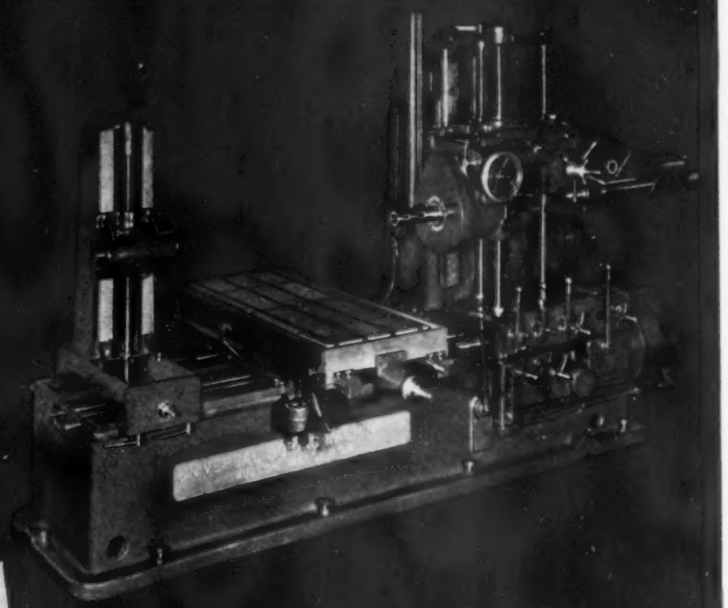
★ Horizontal Bridge Type Machine
★ Hydraulic Expansion of Abrasive
★ Variable Pressure Adjustment
★ Multi-directional Abrading Motion
★ Synchronized Operating Controls
★ Hydraulic Table Movement
★ Adjustable Stroke Control
★ Accuracy to Extremely Close Tolerances
★ Uniform Diameter Sizing
★ Rapid Stock Removal
★ Any desired Degree of Accurate Surface Finish

MICROMATIC HONE CORPORATION
7401 Dubois Street Detroit, Michigan

UNIVERSAL

with the

TRIWAY BED



HORIZONTAL BORING MACHINE

MODERN FEATURES★ INSURE HIGH PRODUCTIVE CAPACITY . . . WITH MAINTAINED ACCURACY

This improved machine—available in three, four and five inch spindle sizes—with the "TRI-WAY" bed developed by Universal—handles boring operations with utmost precision under high production demands.

Design is such that there are no overhanging parts, all units being directly mounted on a deep box type base—a feature that insures utmost stability and rigidity.

The head assembly is of unit design with spindle carrier cast integral with main body of head. Correct spindle elevation is maintained by one long adjustable tapered gib. Back gears and spindle feed reducing gears are located in the head.

Limit trips prevent over travel of table in either direction. An improved method of saddle clamping operates from front of the saddle locks both front and rear. Table clamping is handled from the front of machine. Feed and speed units are mounted in bed without overhang.

Rapid traverse is provided in both directions to all units through a multiple disc clutch which disengages automatically when operator removes his hand from control lever. Feed and rapid traverse cannot be engaged at the same time.

★ ★

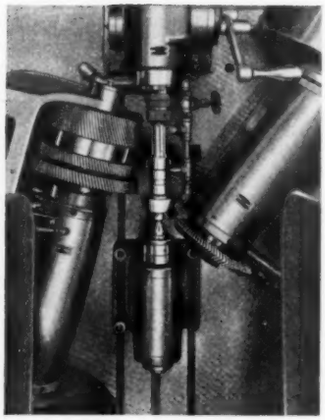
1. THREE BED WAYS—span 30 inches
2. Table Semi-Box design, heavily ribbed
3. Motor mounted directly on base
4. Saddle lead screw nut mounted between guiding ways
5. Centralized right hand control
6. Entire machine above floor line
7. Knife-edged scrapers
8. One shot lubrication for saddle and table assembly
9. Safety guards
10. Vernier measuring system (extra)
11. Rod and dial measuring system (extra)

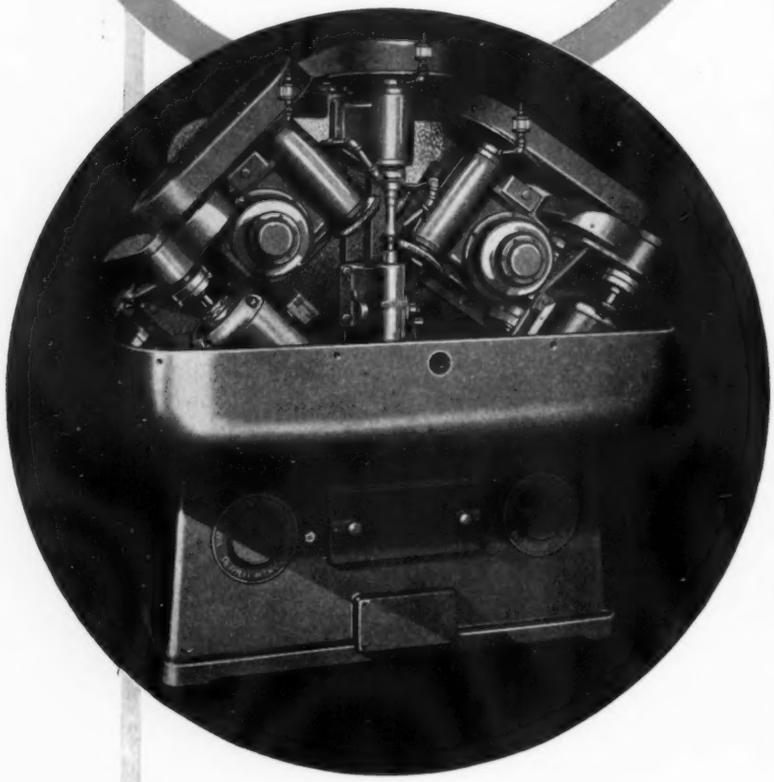
Made in 3, 4 and 5 inch spindle sizes

UNIVERSAL BORING MACHINE CO., HUDSON, MASS.

RED RING ROTOSHAVING MACHINE

REPLACES THREE GRINDERS





Rear axle drive pinions formerly were ground on four diameters and two faces, removing approximately .015" of stock and employing three grinders on the operation.

One Red Ring RotoShaving Machine replaced the three grinding machines and is turning out a production of 137 pieces per hour. Tolerances on bearing diameters are being held to .0005" and on spline diameter to .001". Two thousand pieces are produced with each sharpening of the cutting tools.

The texture of the finished surface is similar to that of a ground surface. Any cylindrical, flanged or conical surface may be RotoShaved. The Red Ring Machine has a fully automatic cycle with push button controls to assure consistent uniformity of product. Consequently any shop man can handle the operation—it requires little skill.

Write for detailed description of the Red Ring RotoShaving Machine.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT, MICHIGAN

Patents Pending

MODERNIZE *Electrically* FOR GREATER PROFITS

How 3 Manufacturers Get Big Returns from *Investments in Machine Tools*

EXAMPLE 1

$1760 Saved Annually in Machining Brake Drums—

A manufacturer of housing drums for excavators sought to improve accuracy and reduce costs. The solution of his problem was found in the latest type of a well-known electrically operated turret lathe. Costs were reduced 34 per cent, or $1760 annually. In addition, 50 per cent of the annual production time of the machine was used profitably on other work.

EXAMPLE 2

Turret Lathe Pays for Itself in Six Months—

A new electrically operated turret lathe machines 41 different parts in small lots and saves more than $300 a week as compared with former production costs.

EXAMPLE 3

200 Per Cent Return in Four Months—

This unusual gain was made by a manufacturer of fluid-sealed oil pumps through cost reduction on the machining of five parts. The saving was effected by using the newest type of turret lathe.

Any reputable equipment will operate—*but* you obtain the greatest profits possible *only* when the correct equipment is skillfully applied to *your* job.

Increased Earnings—These three instances of savings are examples of what can be obtained in almost every form of production by using the latest and best types of equipment. Because plant efficiency is of such importance, *now* is the time to seek increased earnings and the solution of many production problems by using profit-making equipment.

Continuity of Profits—For 62 years General Electric has been assisting an increasing number of purchasers to obtain *continued* dependable and profitable results from their investments in electric equipment. General Electric, Schenectady, N. Y.

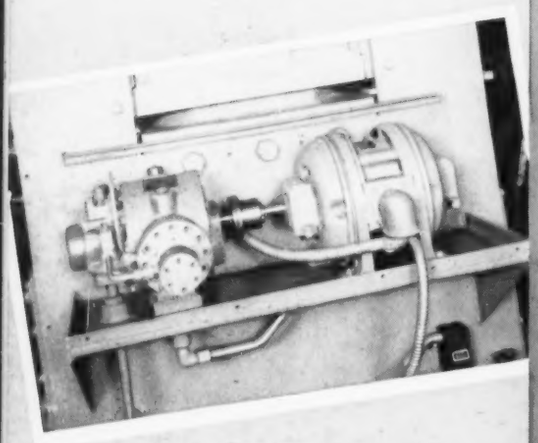
GENERAL ELECTRIC

668-5

WHEN ORDERS SAY, "SHORT SHIPMENT REQUIRED,"

You Need the Speed of NEW Machine Tools

This "Smooth Line" press, built by the Hydraulic Press Mfg. Co., exemplifies the clean lines and co-ordinated electric control of modern machines.



This G-E 5-hp motor drives the hydropower Radial oil pump which operates the press. About this type of motor, a workman in one plant said: "We've been running them on our presses for almost 10 years, and we haven't had one go bad yet."

The G-E push button on the right starts and stops the pump motor; the other controls the motor that operates a hydraulic valve. The G-E interval timer (above the push buttons) controls the length of the dwell.

Money-saving features

A suggestion for you

When you have to meet early shipping dates to satisfy your customer and make sure you get those "repeat orders" in the future, you can't take a chance on slow, worn-out machines to do the job. You need the fast, accurate work that *new* machine tools give you.

Many of these new tools combine in one machine the functions that formerly required three, and they save time because only one set-up is necessary. They are steadier and safer, and their "clean-line" design often saves needed floor space.

By the use of limit switches, push buttons, and time switches, the driving motors and mechanical parts are easily co-ordinated. And because this sensitive control is conveniently located and handy to the operator, it's easier for him to turn out the work quickly. By putting in speedy, new machine tools, and machines like this "Smooth Line" press built by the Hydraulic Press Mfg. Co., you can do more work in less time without sacrificing any quality.

Because you want smooth, flexible operation, specify General Electric motors and control when you order your machine tools. You'll get the *right* motors and the *right* control—*properly co-ordinated*. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

668-2

See more savings through

CIRCLE "C" SUPER HIGH SPEED STEEL

When it's a question of reducing machining costs and stepping up production (on jobs where high speed steel is the indicated cutting tool), you'll find the answer in CIRCLE "C". It will give desired results through at least 25% faster machine operation, greatly increased cuts and feeds, extra long production between grinds. Satisfyingly longer tool life compensates for the somewhat higher initial cost.

Additionally, CIRCLE "C's" carefully balanced cobalt-tungsten analysis assures profitable operation on the critical, harder alloys . . . hence its success with typically tough jobs involving aeroplane motor parts, bearings and the like. The more quickly you find out about this unusual high-speed steel the better . . . for savings' sake. Full information is yours for the asking. Ask now!

Firth-Sterling's companion lines of Sintered Carbides and Tool Steels make available a Complete Shop Tooling Service through one experienced organization.

FIRTH-STERLING STEEL COMPANY

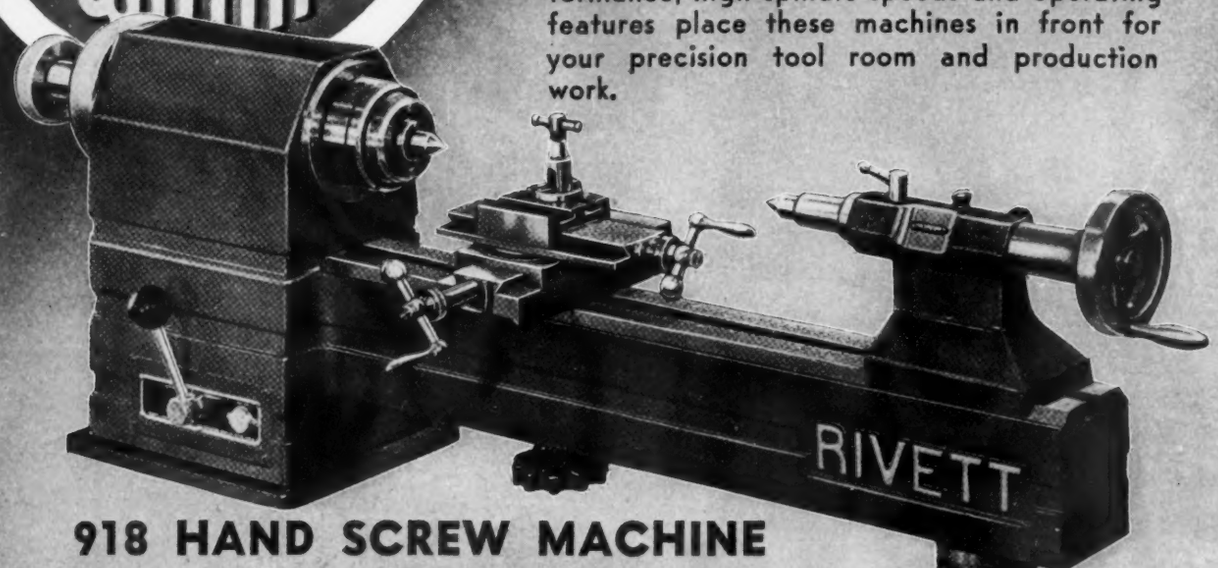
OFFICE AND WORKS:
McKEESPORT, PA.
BRANCH WAREHOUSES:
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT

MORE PRECISION WORK

Companions

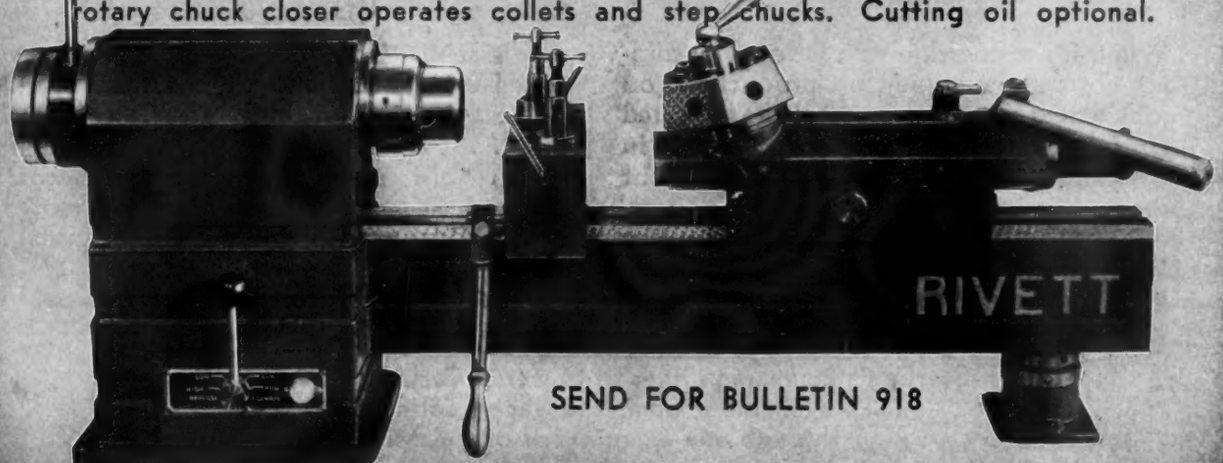
918 BENCH LATHE

Bulletin 918 presents Rivett high precision, heavy duty bench lathe and hand screw machine. The balanced design, vibrationless performance, high spindle speeds and operating features place these machines in front for your precision tool room and production work.



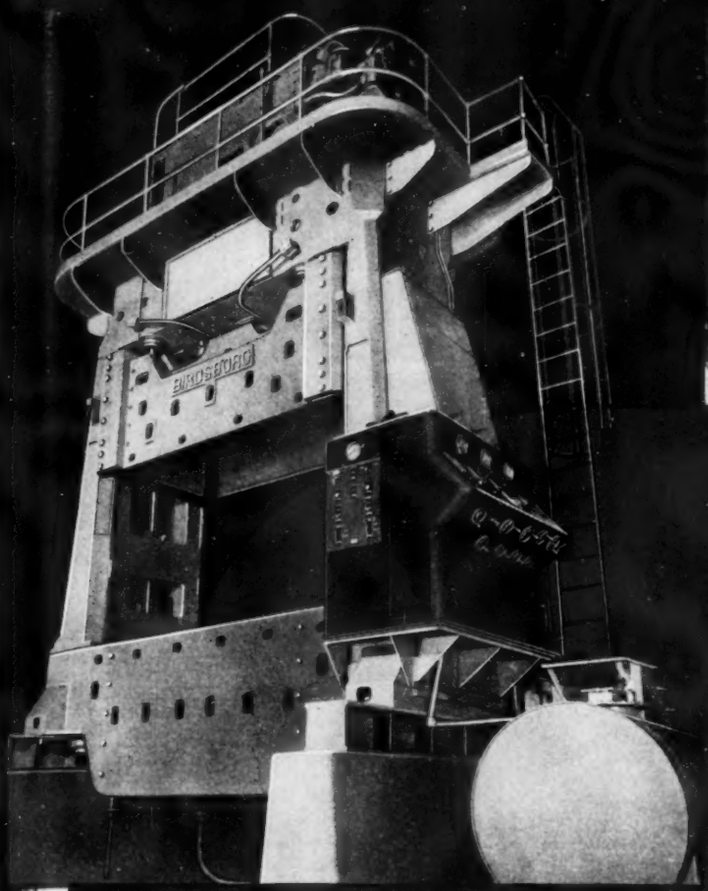
918 HAND SCREW MACHINE

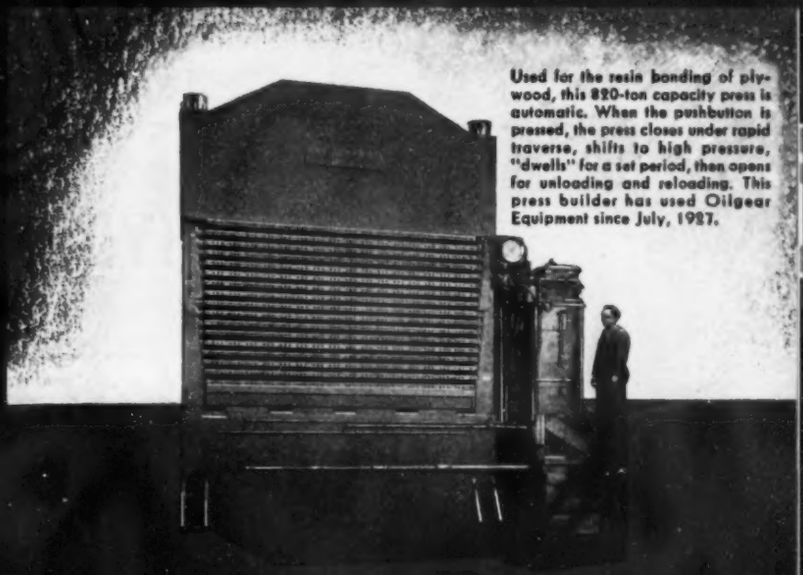
As with the bench lathe, the hand screw machine has all-electric V-belt drive, speeds to 3750 r.p.m., 9″ swing, ball bearing spindle with long taper key-drive nose and draw-in or push-out type 1″ capacity collets. It is designed for rapid manufacturing of duplicate precision parts requiring up to eight successive operations at one chucking. The work may be done on bar stock passed through spindle and held in push-out collet or on unmachined or partly machined parts individually chucked in draw-in collet, step chuck or jaw chuck. Ball bearing rotary chuck closer operates collets and step chucks. Cutting oil optional.



SEND FOR BULLETIN 918

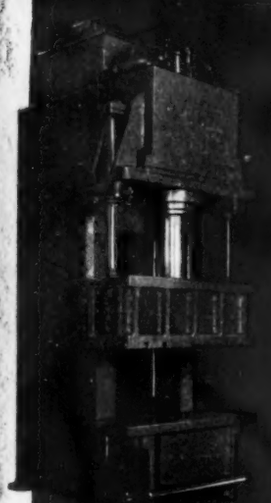
RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT



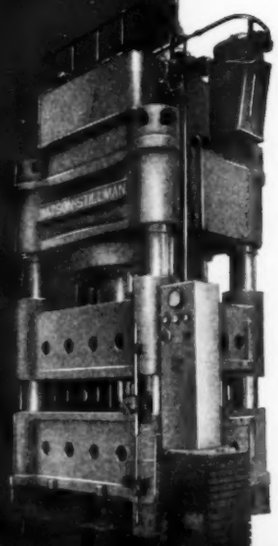


Used for the resin bonding of plywood, this 820-ton capacity press is automatic. When the pushbutton is pressed, the press closes under rapid traverse, shifts to high pressure, "dwells" for a set period, then opens for unloading and reloading. This press builder has used Oilgear Equipment since July, 1927.

WHAT 17 *leading* PRESS MANUFACTURERS ARE DOING



(Above) When the builders chose Oilgear Fluid Power Pumps and Equipment for this great forming press, they had been using Oilgear since June, 1931. The conclusion is obvious.



(Above) This press builder writes, "All our customers using Oilgear-equipped Presses are 100% satisfied with their efficiency and performance, and especially pleased with the ease of Oilgear control."

17 leading manufacturers of huge production presses are using Oilgear Fluid Power Pumps and Valve Equipment, on both standard and special presses. One has equipped more than 100 presses with Oilgear; another more than 60. More recent "converts" to Oilgear Fluid Power account for 5 to 25 units each. Total figures probably represent a major portion of the business done in these giants.

The reason for this growing use *and growing preference* is clear. The application of Oilgear Fluid Power means a power problem *solved*... a greater measure of dependability, and protection to the user's reputation. The widely known superiority of Oilgear Fluid Power in design, engineering and performance is an asset. User satisfaction is assured. It is worth your while to read Oilgear Bulletin 47000 before you buy any more Fluid Power Equipment.

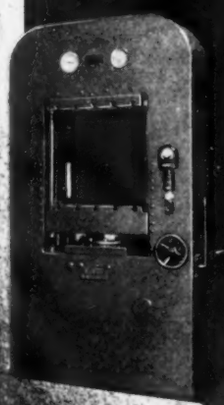
Send coupon for this 56-page Fluid Power Manual *today*. THE OILGEAR COMPANY, 1307 W. Bruce St., Milwaukee, Wis.

OILGEAR

Trademark Reg. U. S. Pat. Off.

OILGEAR

THE MOST EFFECTIVE APPLICATION OF *fluid power*



(Above) This 4500-ton Metal Forming Press is one of a number of recent Presses by this manufacturer employing all-Oilgear Fluid Power. This company has used Oilgear since May, 1931.

(At left) A Self-Contained, Semi Automatic Hot Moulding Press, capacities to 500 tons... employing Oilgear Fluid Power Systems. Another leading press manufacturer who uses Oilgear Equipment extensively.

THE OILGEAR COMPANY, 1307 W. Bruce Street, Milwaukee, Wis.
Please send me a copy of Bulletin 47000 without obligation.

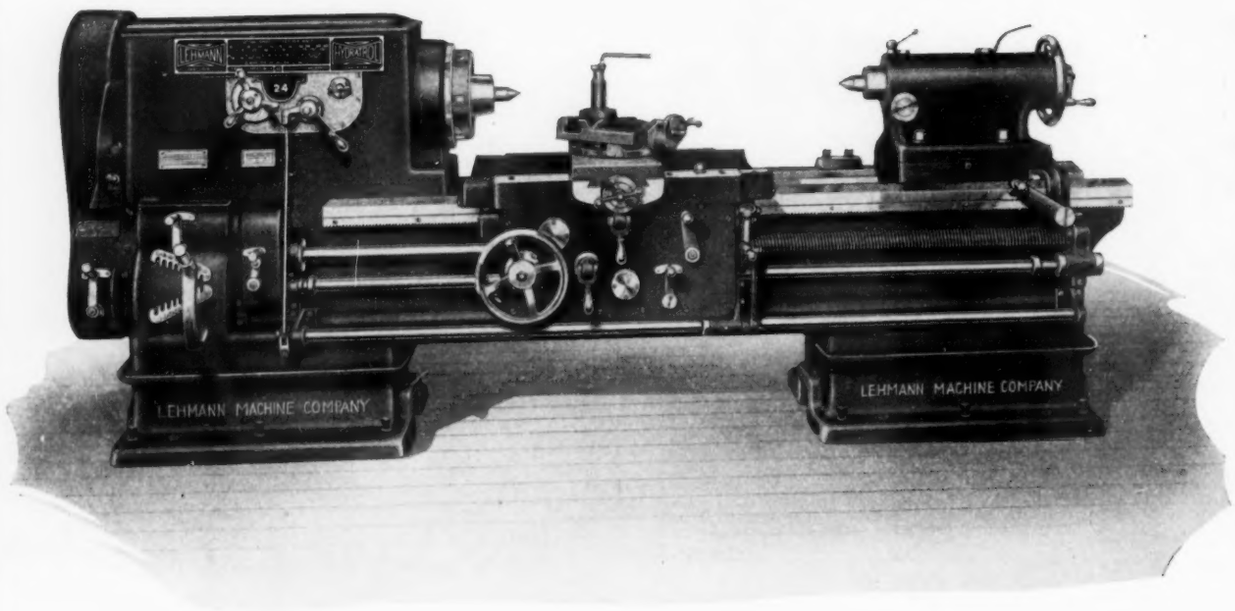
Name.....

Company.....

Address.....

City.....*State*.....

LEHMANN HYDRATROL LATHES



We believe that this 24 inch extra heavy duty lathe represents the highest development in a machine of its size and that it

- *Is heavier*
- *Is more powerful*
- *Is more easily operated*
- *Is more automatically lubricated*
- *Is more completely anti-friction equipped*

Than Any Other Lathe of Comparative Size

THE HYDRATROL LATHE is built in sizes 16 inch to 36 inch and up to 16 inch hole in spindle also standard geared head lathes sizes 16 inch to 24 inch

BY

LEHMANN MACHINE COMPANY

CHOUTEAU AT GRAND BLVD. **ST. LOUIS, U. S. A.**

THERE'S *Better, Faster* BROACHING IN EVERY ONE OF THESE 5 NEW OILGEAR MACHINES

Again pioneering important fluid power advances, Oilgear announces 5 lines of Broaching Machines improved in design, construction and performance. These new Oilgear Broaching Machines provide longer life and greater tool capacities, relieve the operator of time-wasting operations, and make his work easier. Operations hitherto manually performed are now handled automatically. The operator's control over the machine, through the cycle, has been made easier, more convenient and comprehensive.

Broaching and return speeds are faster, and may be varied independently of each other according to the requirements of the job. Cycle speeds are faster too. These machines are more flexible in their application. They work at peak loads up to 150% of normal capacity. Yet work, tools, pumps and machines are fully protected against harmful overloads. Leading users tell of sensational gains in production. One user bought 26 Oilgear Broaching Machines on a single order. Write for complete descriptive bulletin for the machine you want. Use the handy coupon at once. THE OILGEAR COMPANY, 1323 W. Bruce St., Milwaukee, Wisconsin.

Vertical Pull-down. For Internal Broaching. Eliminates tool handling, threading and centralizing by hand. Simple push-button operation. 3 Sizes.

Cyclematic. Simplified automatic internal broaching. Improved design. Handles multiple broaching. 3 sizes. Convenient loading level regardless of size or stroke.

Double Slide Vertical. 5 Sizes. Surface Broaching. Sequent operations on one or more parts on same machine. Speed of each slide independently varied to suit job. Control and shuttle table features same as Single Slide Broach.

Single Slide Vertical. 5 Sizes. Surface Broaching. Manual, semi-automatic and full automatic control. Shuttle table makes loading and unloading easier. Work clamped and unclamped automatically. True harmonic design permits high speed without shock.

Horizontal. 9 Sizes. High Speed, Internal and External Broaching; accurate, extra-convenient control and operation.

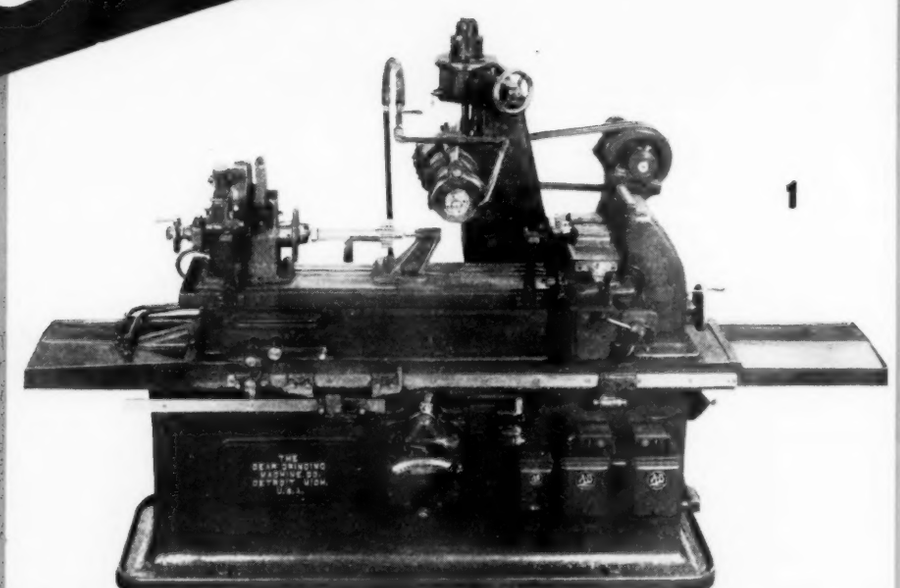
ALSO AN EXTENSIVE LINE OF PRESSES FOR PUSH BROACHING

The Oilgear Company, 1323 W. Bruce Street, Milwaukee, Wisconsin
Please send descriptive bulletin of the following new Oilgear Broaching Machines. (Check which)

- ☐ XL Horizontal
- ☐ XD Double Slide Vertical
- ☐ XS Single Slide Vertical
- ☐ XP Vertical Pulldown
- ☐ XM Cyclematic

Name..... *Title*.....
Company.....
Street.....
City..... *State*.....

CUSTOMERS increased 91% in 28 MONTHS



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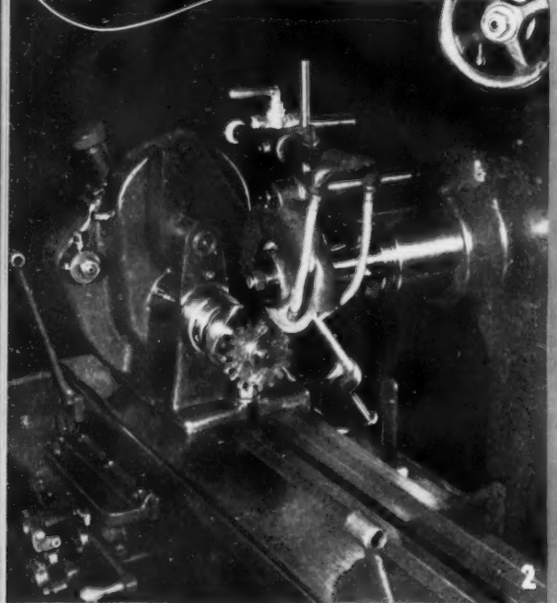

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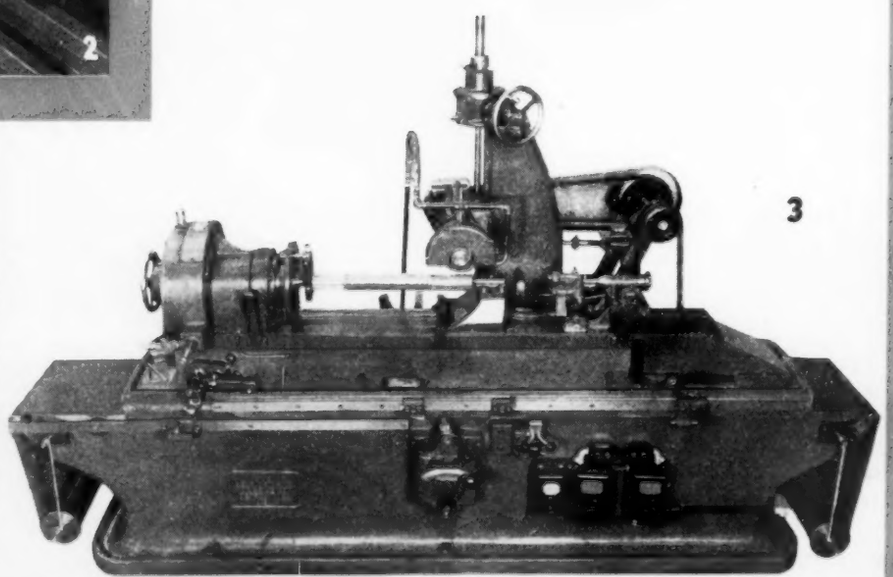


3

. Into this 10" capacity Gear Grind-
g Machine—as into every one of
ur Gear and Spline Grinding Ma-
ines—is designed and built great
mplicity of operation, rapid produc-
on, and ability to finish gears within
xtremely fine limits.—**2.** Our Gear
nd Spline Grinding Machines are
xceptionally simple in design. This
eature, together with fine materials
nd painstaking workmanship, en-
ows these machines with such long
fe that those purchased more than
5 years ago are still in use.—
. Smoothness is a notable feature
f this Spline Grinding Machine, as
is of all our machines. We employ
low-pressure, hydraulic system.

# of our GEAR AND SPLINE GRINDING DEPARTMENT

because:

Hardened and Ground Gears and Splines

1. Have greater load-carrying capacity;
2. Assure longer machinery life;
3. Reduce noise and vibration;
4. Eliminate tear-downs in assembly.

Various machine industries, and notably machine tool builders, are turning to hardened steel gears with ground profiles.

Our own sales records over the last three years illustrate the growing strength of this very plain and definite trend.

From January, 1938, to April, 1940, our new customers for gear and spline grinding have increased by a fraction more than 91 percent.

DEMAND FOR OUR GEAR AND SPLINE GRINDING MACHINES HAS ALSO GREATLY INCREASED—The strength of this trend is revealed also in the sales records of our Manufacturing Division.

In the last three years, the percentage growth in sales of our Gear and Spline Grinding Machines greatly surpasses even the large increase in our gear and spline grinding business. This is true of both our foreign and our domestic sales.

THE STEADY MOVEMENT TOWARD MACHINE REFINEMENT—With the increasing demand for ever higher speeds and greater loads, machine designers are faced squarely with two alternatives.

One, is to go to greater weight and bulk. The other, is to take advantage of hardened alloy steels to achieve greater speeds and greater load-carrying capacity, without adding—*or even while reducing*—bulk and weight.

When gears and splines of hardened alloys are specified, however, an additional operation is called for; namely, the grinding of the gear tooth profiles and spline key surfaces to correct the inaccuracies which result from heat treatment.

As is well known, these inaccuracies, if uncorrected, would cause a non-uniform distribution of the load on gear teeth and spline keys. Gears with inaccaurate involute profiles transmit rotation at a variable velocity. All of these variations cause noise, vibration and premature wear . . . Such inaccuracies are eliminated by our successful method of grinding tooth profiles and spline key surfaces after thermal treatment.

THE FOLLOWING SPECIFIC ADVANTAGES—are assured by our method of Gear and Spline Grinding, to produce a fine accuracy of tooth spacing and profile:—

1. GREATER LOAD-CARRYING CAPACITY OF GEAR TEETH

—Tests by the A.S.M.E. committee on the strength of gear teeth show that errors of as little as a few ten thousandths difference in gear teeth, one from another, result in considerable load-carrying losses.—

2. PRODUCTION ECONOMIES

(a). Grinding tooth profiles makes accurate cutting or hobbing of the gears unnecessary. The finish cut is not required. (b). Grinding eliminates the use of non-deforming steels or specialized heat treatment in attempts to lessen distortion. (c). Grinding virtually does away with costly tear-downs and reassembly, with their accompanying delays. All ground gears and splines are interchangeable. (d). These economies cover—*and in the instances of most manufacturers more than cover*—the cost of gear tooth and spline key grinding. *Improvements which the practise of gear and spline grinding brings to machine operation, therefore cost the manufacturer not a penny's worth of premium.*

3. MORE SILENT OPERATION.

4. SMOOTHER OPERATION.

—Smoother operation is due largely to the elimination of torsional vibration. It secures to the machine owner a basic economy; namely, prolonged machinery life. This is a value eagerly welcomed by most production engineers.—

Our business is conducted through two departments. We maintain a *Gear and Spline Grinding Service*—for the many manufacturers who may not have sufficient call for gear and spline grinding to justify installation of grinding equipment. This service is accurate, prompt, economical, and national in scope.

We are also manufacturers of *Gear and Spline Grinding Machines.* Our line is exceptionally complete. Our designs incorporate basic advantages of first-rate importance.

For details—either of our Grinding Service or of our line of Gear and Spline Grinding Machines, and Combination Machines—write The GEAR GRINDING MACHINE Company, Detroit, Michigan, U. S. A. We suggest that you send us your prints, with any other data that may help us cooperate fully with you.

The

GEAR GRINDING MACHINE COMPANY

DETROIT, MICH. U.S.A.

MODERN POWER WITH WELCO TORQUE MOTORS

"Power where you want it" is the slogan of this line of WELCO torque motors. Clamping and unclamping, raising, lowering, traversing, indexing and many other time-consuming motions are eliminated by these motors. Modern machine tools and modern equipment result.

Among the prominent advantages offered are built-in facility, simple design, low cost and better appearance. These motors will modernize existing equipment—they are also ideal for incorporation in products that demand power in particular spots. Let our engineers work with you. Modernize with Welco Torque Motors.

Suggestions made by our engineers incur no obligation. Simply write direct to

The B. A. Wesche Electric Co.
1622 Vine St.,
Cincinnati, Ohio

means

QUICK ACTION
SIMPLIFIED CONSTRUCTION
BUILT-IN POWER

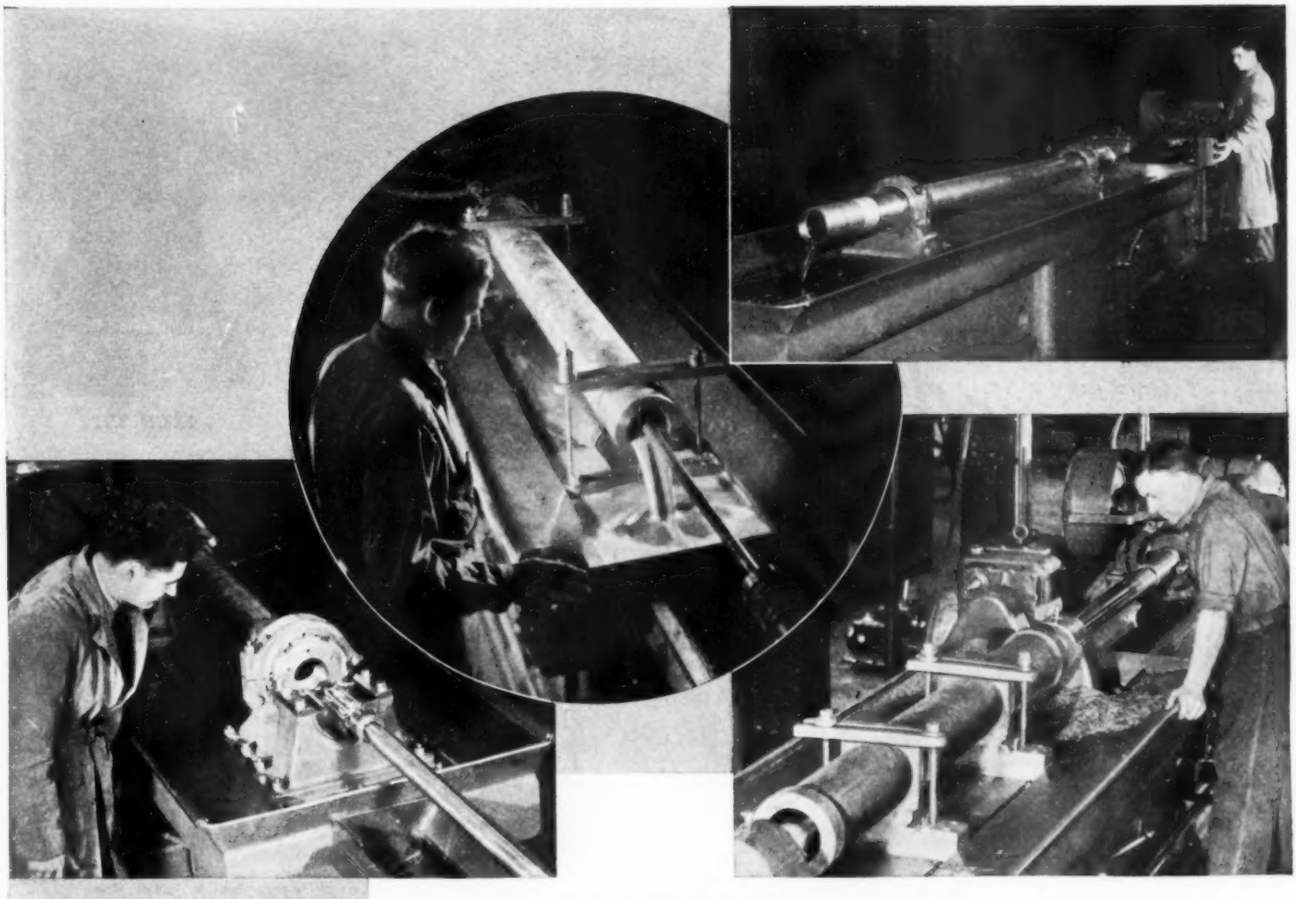
Built-in Flange mounting

Flush type Flange mounting

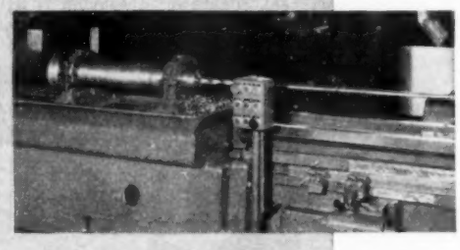
Ventilated drip-proof construction

Motor with built-in brake

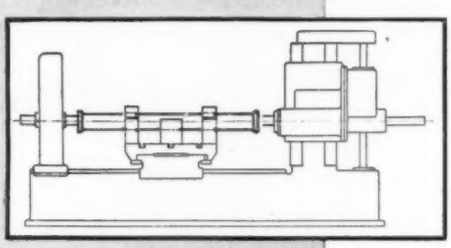
THE B. A. WESCHE ELECTRIC CO.
1622 VINE STREET CINCINNATI, OHIO

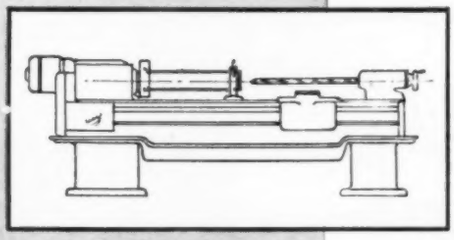


HERE'S PROFITABLE RELIEF



FOR YOUR BORING AND DRILLING EQUIPMENT...





BORING, honing and drilling operations, such as shown above, are easily handled on our boring and honing machine. The same type of work when placed on standard general purpose machines often results in awkward set-ups and costly delays due to excessive handling. Two common set-ups of this type are shown in the sketches to the left.

You can eliminate a great share of this costly fuss and bother by routing this type of work over our combination boring and honing machine, thereby leaving your present boring and drilling equipment on full time work, for which it is better suited.

This machine will bore or drill — and *hone*.

Less than twenty minutes is required to completely change over the machine from boring to honing, or vice versa. If production requirements justify, fixtures can be furnished to handle parts produced in quantity, and set-up time per piece will be reduced accordingly. You thereby gain the benefit of two machines in the same floor space and, with the *same operator*. Costing but little more than a machine for EITHER boring or honing, it is a most economical investment for plants handling a wide range of drilling, boring and honing operations on a large variety of parts.

Complete machine details are covered in our "Horizontal Boring and Honing" booklet, which we will mail upon request.

W. F. AND JOHN BARNES COMPANY • ROCKFORD, ILLINOIS

WALTHAM MACHINES

TRADE MARK
REG. U.S. PAT. OFF.

On parade!

ARCH TYPE

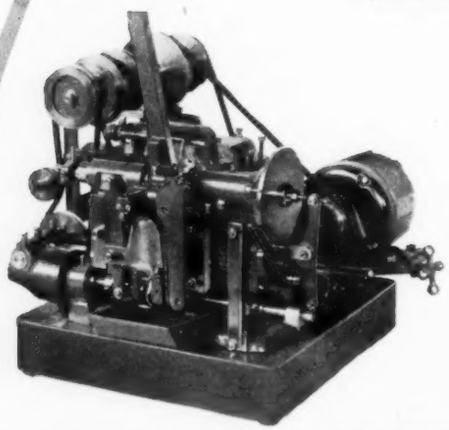
WALTHAM SUB-PRESSES and DIES

Wherever Waltham Sub-Presses and Dies are used, the work turned out is of uniformly high precision. The clean quality of the stampings eliminates any necessity for hand filing and finishing and therefore results in outstanding time savings and lowered costs.

Maintained accuracy is assured by the sturdy, rigid construction and perfect alignment. Close fit is also assured through adjustment provided for wear.

Both arch and overhang types are available in sizes up to 6-inch plunger diameter.

It will pay you to use Waltham Sub-Presses on your work and insure the production of parts that are immediately ready for assembly.



WITH MAGAZINE FEED AND MOTOR DRIVE

WALTHAM AUTOMATIC PINION and GEAR CUTTERS

With these fast, compact, automatic machines, any workman can produce parts which meet tool room standards of accuracy.

These modern gear cutters have the power and speed to insure high production of small gears and pinions. They will handle parts such as these up to 1½ inch pitch diameter and are ideal for producing watch, meter and gage pinions, gears and sectors at low cost. For small diameter pinions fully automatic operation can be attained by adding the magazine feed which is available for use with this machine.

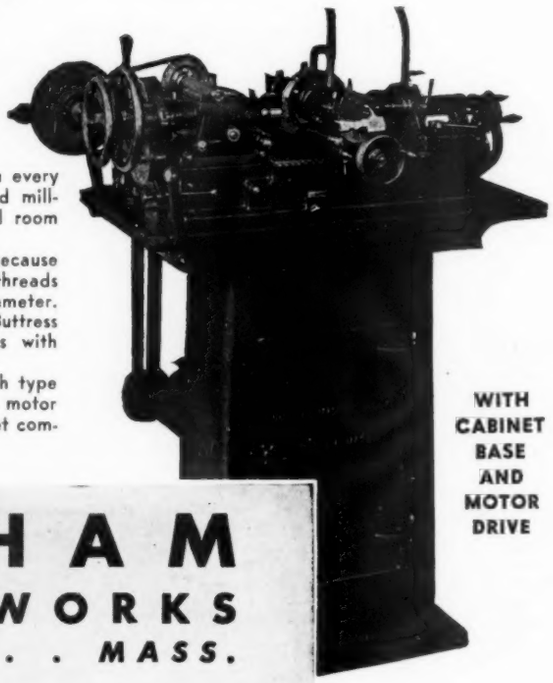
Waltham is prepared to furnish cutters for these and other machines of similar nature.

WALTHAM THREAD MILLERS

Waltham Thread Millers are modern in every detail and will handle precision thread milling on a production basis or for tool room requirements.

Versatility is an outstanding feature because these machines will produce precision threads and small worms up to 2 inches in diameter. They will cut V, N.S., Whitworth and Buttress threads and threads of special types with equal facility and precision.

Waltham offers Thread Millers in bench type with countershaft drive as well as in a motor driven floor type. It will pay you to get complete information.



WITH CABINET BASE AND MOTOR DRIVE

All Waltham Machines are fully and clearly described in bulletins which are available on request and without obligation. Write for further details.

WALTHAM
MACHINE WORKS
. WALTHAM . . . . . MASS.

PRODUCTO EQUIPMENT
FITS THE NEEDS OF MODERN SHOPS

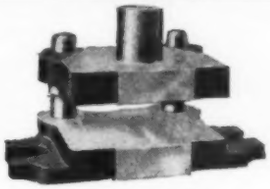
QUICK SERVICE for DIE MAKERS from Coast to Coast through 3 Assembly and Warehouse Plants; Bridgeport, Connecticut; Detroit, Michigan and Cleveland, Ohio

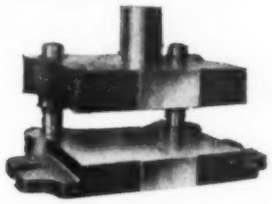
Better service is also offered for users in Ohio, Western Pennsylvania and West Virginia. Producto Die Sets are assembled and shipped from **Die Supply Company, 1390 East 30th St., Cleveland, Ohio.**

Complete facilities at Detroit are available for manufacturing, assembling and shipping all catalogued and Special Die Sets. Prompt shipments throughout the Middle West by motor truck.

Pacific Coast users can now obtain Producto Die Sets from stock at Joseph C. Fletcher, 1415 Folsom Street, San Francisco, California and Frey Industrial Supply Co., 3828 Santa Fe Avenue, Los Angeles, California.

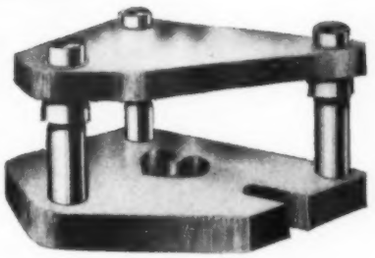
Ask for Catalog No. 8

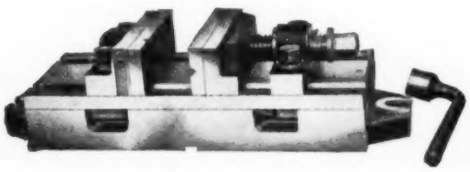




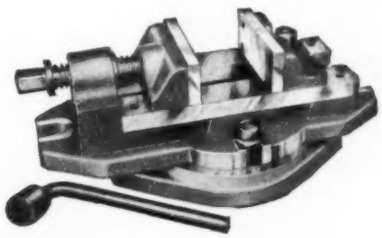
Producto
Master and Standard Die Sets

Answer every purpose for mounting Dies for Power Presses, Plastic Molds and Die Castings.





6″ Heavy Duty Producto Machine Vise with double the capacity of ordinary vises.



Producto General Purpose 4½″ Vise. Available in swivel and plain types.

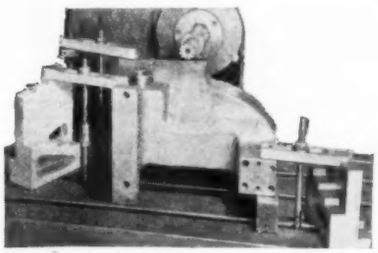
Machine Vises
which support and clamp work on hardened surfaces

Producto offers modern machine vises which assure accuracy, hold securely and are practically indestructible.

They are adapted to heavy duty milling and drilling as well as for holding small parts in production—are fast, safe, compact and sturdy.

Bodies are of semi-steel, reinforced with hardened and ground wearing and jaw guide plates. Jaws are accurate in any position. Front and rear jaws and nut block are adjustable in any desired position to provide extra large opening between jaws.

Complete details available on request.



Set-Up Tools
to simplify setting up and clamping

These Producto tools are standardized and provide universal applications for a wide range of machining operations. They assure time savings, convenience and safety and include: "Build Up" Steel Blocks, "T" Slot Nuts and Bolts, Work Holding Clamps and Adjustable Clamp Screw Jacks. Write for a copy of application bulletin.

A Utility Press of Wide Adaptability

Producto offers a sturdy Press for tool and die room service with power greatly in excess of ordinary arbor presses. Write for detailed information.

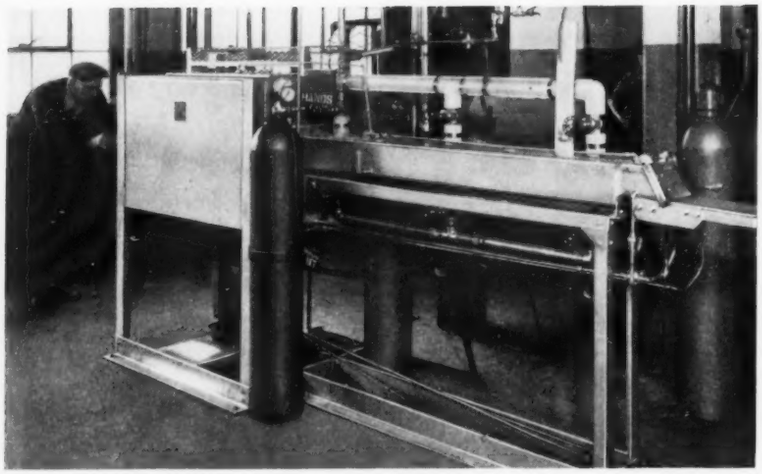
Distributors of **Dickerman Automatic Press Feeds.**

PRODUCTO

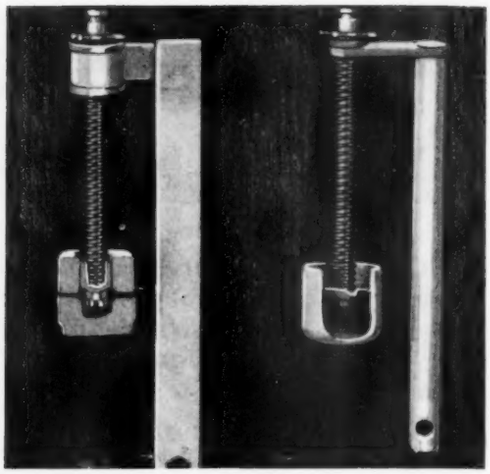
THE PRODUCTO MACHINE CO.

990 HOUSATONIC AVE., BRIDGEPORT, CONN.

3017 MEDBURY AVE., DETROIT, MICHIGAN



The Zenith Carburetor Company have made definite savings by redesigning their product to assemble it by brazing. Using a Hoskins Hydrogen Brazing Furnace, they now copper braze their accelerating pump piston, which cuts its former production cost 24%.

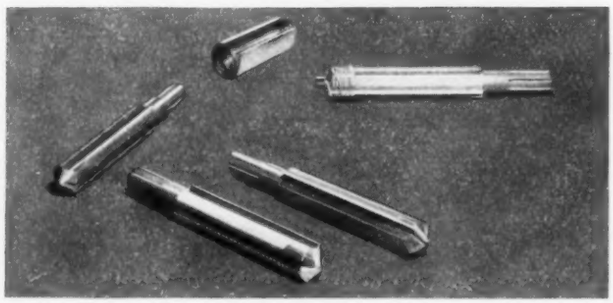


Above is the "before and after" of the Zenith pump piston, on which they saved 24%. By brazing the throttle lever, its cost fell 27%.

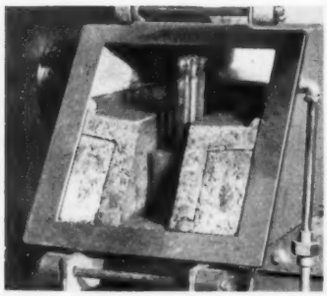
A "BRAZE" THAT HOLDS ••• AND SAVES

The users of these compact Hoskins Brazing Furnaces say they represent a good, sound investment. That they do a fine brazing job. Make a braze that holds. That on brazing carbide tips to tools, they never worry about the tips coming off. The users like the low hydrogen consumption, the gas input being automatically controlled. If brazing interests you, the full story on Hoskins Brazing Furnaces will be to your advantage. Ask for it.

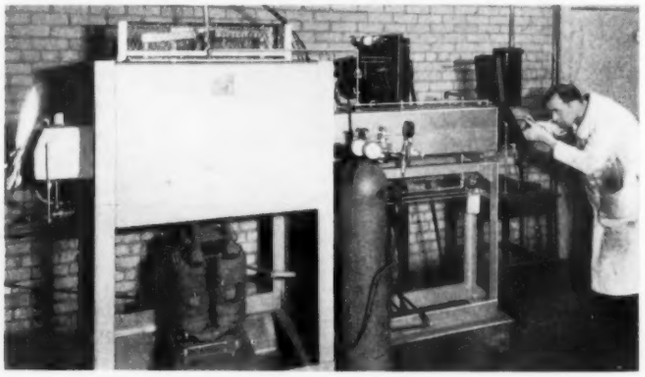
HOSKINS MANUFACTURING COMPANY, DETROIT, MICHIGAN



The two pictures above show carbide tipped tools made by Michigan Tool Company and their two 12½ K.W. Hoskins Brazing Furnaces, which are run at 2100° F., proving the quality of their Chromel heating elements.



Below and above are shown the Hoskins Brazing Furnace at the Willey's Carbide Tool Company and one of their milling cutters. Note the "gutter" (above) for tall tools.



HOSKINS PRODUCTS

Electric Heat Treating Furnaces • Heating Element Alloys • Heat-Resistant Castings • Nickel-Chromium Welding Wire • Thermocouple and Lead Wire • Special Alloys of Nickel • Pyrometers & Protection Tubes

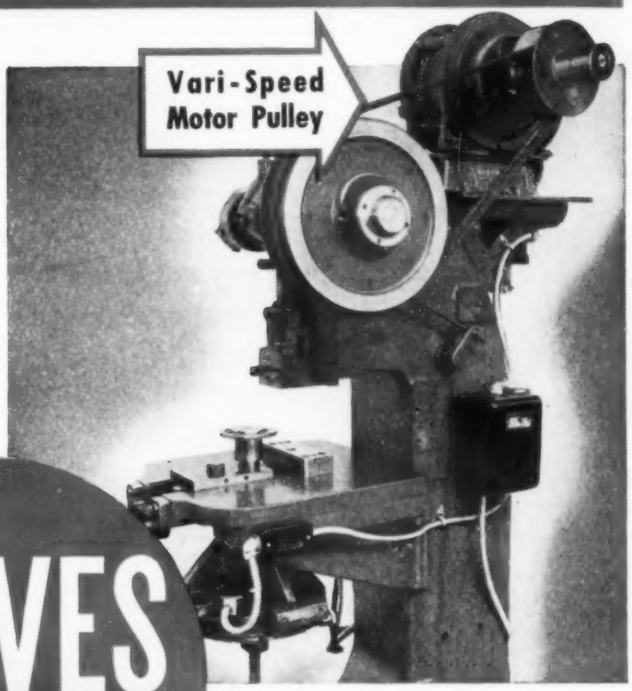
HEATING ELEMENT WIRE — Chromel — NICKEL-CHROMIUM

TAKING THE "CAN'TS" OUT OF MACHINE PERFORMANCE

● The difference between what a machine CAN do and CAN'T do is often a matter of speeds. When the best speed is instantly available to meet each changing condition in your plant, a lot of the can'ts of production processes are eliminated. Pictured here are three REEVES-equipped machines. Each is a better machine, capable of doing better work, more work, or both, because operating speeds are infinitely adjustable. Quality of production is improved with operation at correct speeds, and a wider range of products may be handled on the same machine. More than 140,000 REEVES units are now in service in 18,000 plants. Builders of 1,321 different makes of machines provide REEVES Speed Control as standard equipment.

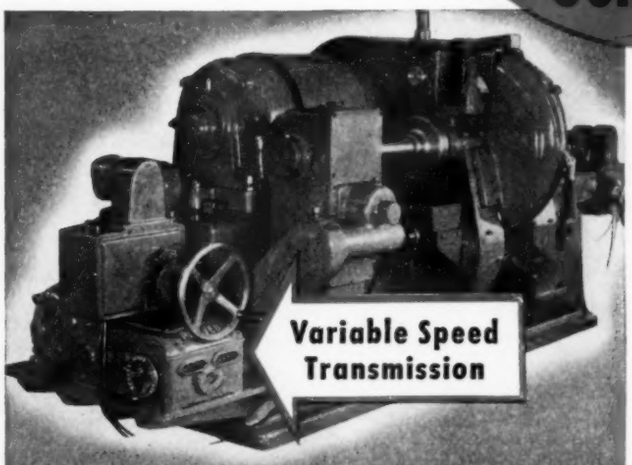
The complete REEVES line, known throughout industry for its dependability and accuracy, is built around three basic units, each having its own field of application. Find out how inexpensively REEVES Speed Control can be applied to your machines, what units are best for your needs, how they should be installed. A nation-wide staff of seasoned engineers is ready to serve you. Write us. And if you haven't a copy of the latest REEVES Catalog G-397, send for it. There is no obligation.

REEVES PULLEY COMPANY
Dept. A,
Columbus, Indiana



Versatility of this high speed notching press, to handle different sizes and shapes of motor laminations, has been greatly improved by REEVES infinitely variable speed adjustability.

REEVES Variable Speed Control



Accurate finishing to length of the four ends of universal joints would be more difficult on this machine without the ability to adjust grinder speeds to the changing diameters of grinding wheels. Same machine may be used for other work, simply by changing speeds.

Operator can handle a wide range of width and gauge of stock on this Metal Ribbon Forming machine, because merely by turning handwheel he speeds up or slows down the machine exactly as required for each job. No unnecessary delays in production.

SAVE ON PRODUCTIVE FLOOR SPACE

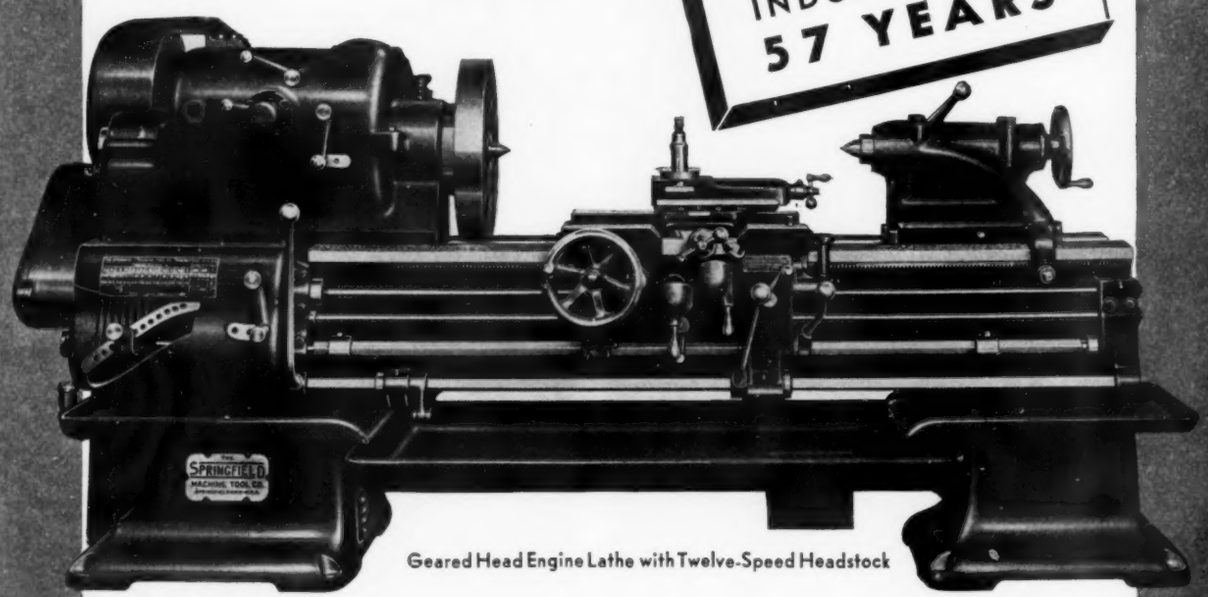
WITH THE GREATER SPEED
AND CAPACITY OF THIS

SPRINGFIELD PRECISION LATHE

● The Springfield Precision Lathe offers you greater profit potential by providing increased production capacity through greater speed and ease of operation. Twelve-speed *HEADSTOCK*, with only half of its tough, easy-shifting spur gears meshing at one time; highest grade bearings, dependably spray-lubricated; V-Belt or silent chain drive *MOTORS* in large cabinet leg under headstock; permanently true *BED*, made of high test alloy to resist warp under severe service; simple, centralized controls; absolutely rigid *TAPER ATTACHMENT* with hair-trigger adjustment; sturdy *COMPOUND REST* sitting firmly under heaviest pressures; all bearings and the bedways oiled from one well in the *TAILSTOCK* . . . here are features that combine to give you maximum capacity per square foot of floor space . . . and will continue to do so for years to come.

SEND FOR BULLETIN NO. 162 . . .
which illustrates, and describes in detail, all the features mentioned above. Write for it NOW!

IN STEP WITH THE NEEDS OF INDUSTRY FOR 57 YEARS



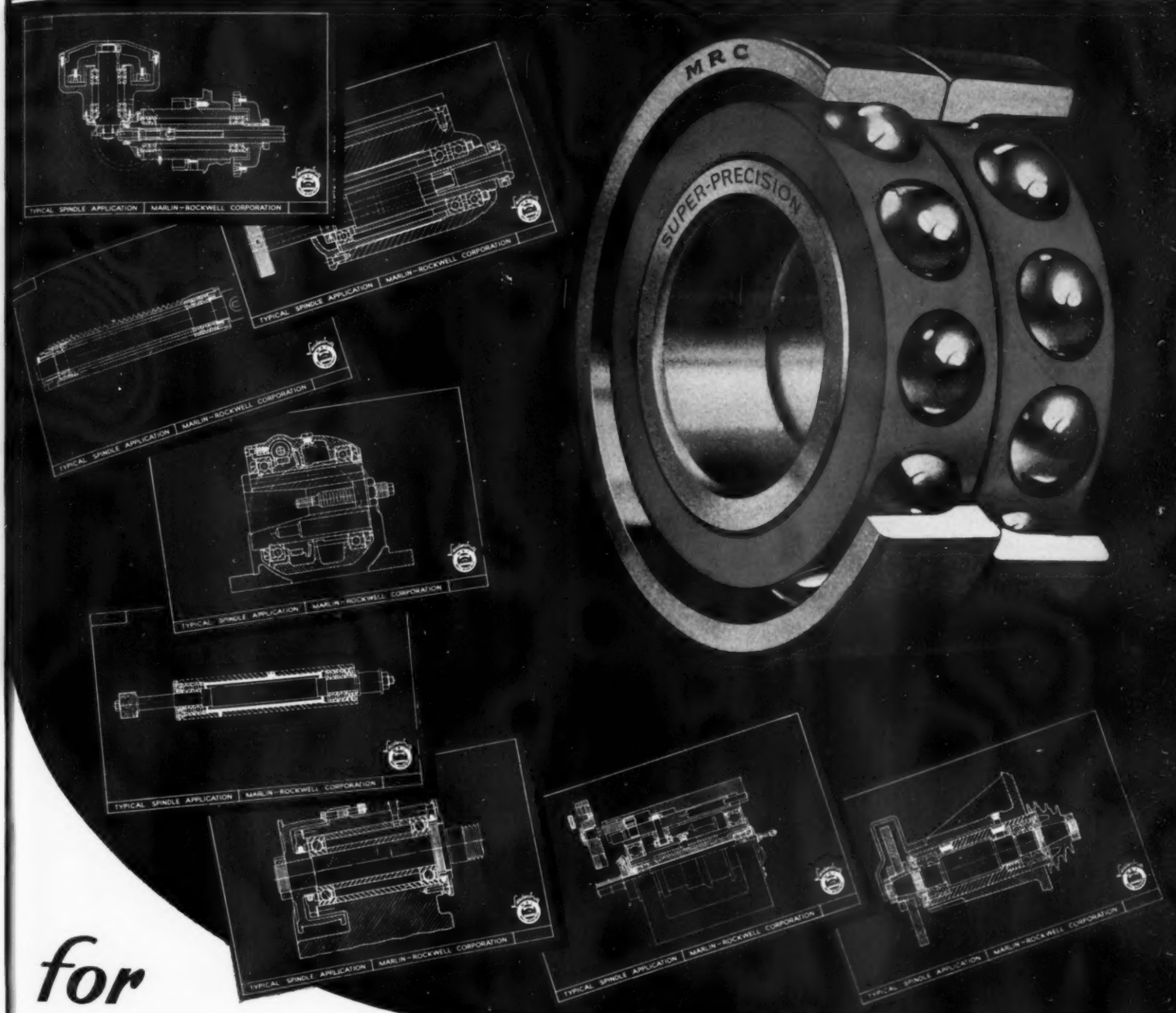
Geared Head Engine Lathe with Twelve-Speed Headstock

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO

Successful . . .

MACHINE TOOL SPINDLES



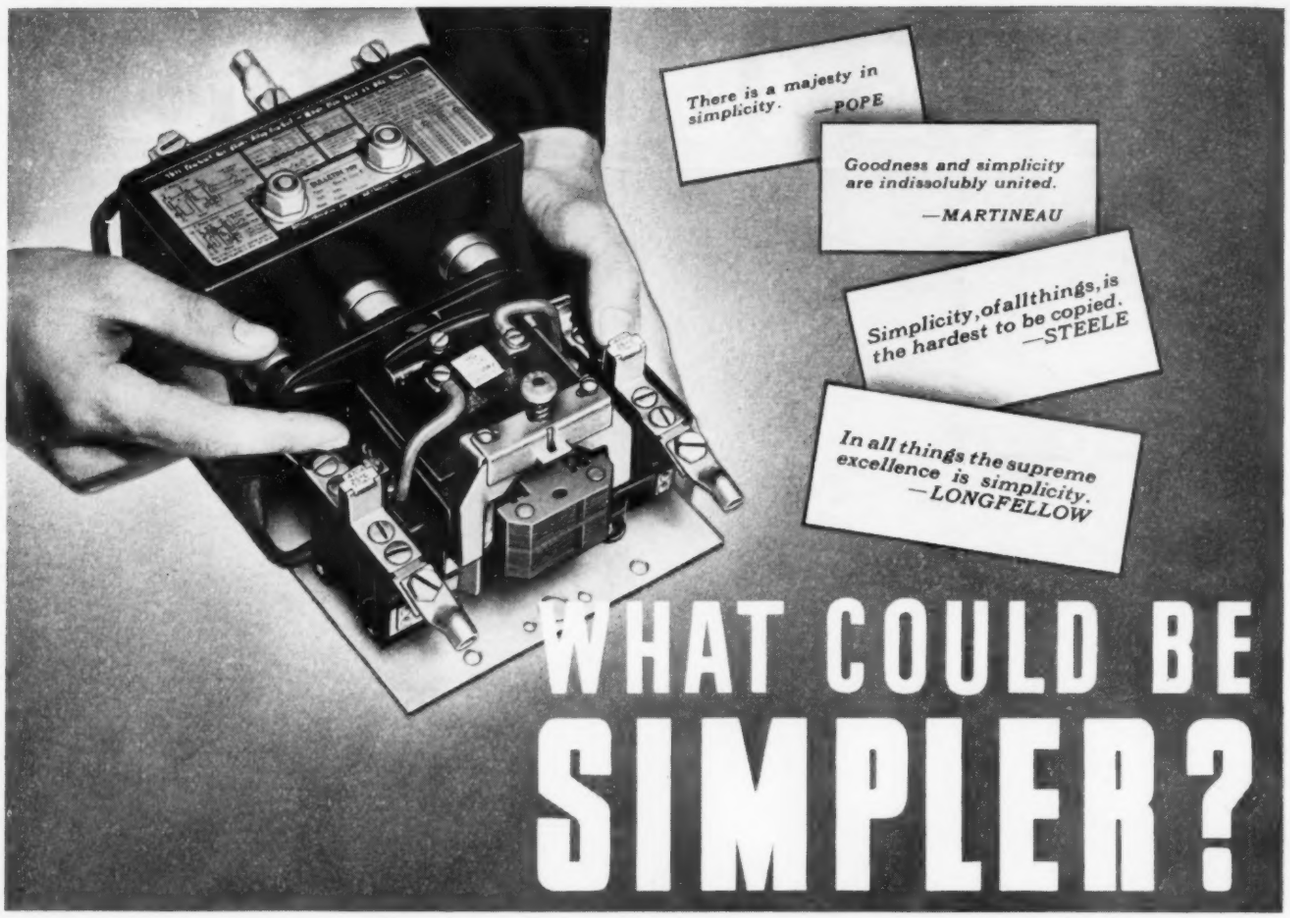
for

ACCURACY · RIGIDITY · HIGH SPEEDS

M-R-C
BALL BEARINGS

MARLIN-ROCKWELL CORPORATION

EXECUTIVE OFFICES: JAMESTOWN, N. Y. FACTORIES: JAMESTOWN, N. Y., PLAINVILLE, CONN.


There is a majesty in simplicity. —POPE
Goodness and simplicity are indissolubly united. —MARTINEAU
Simplicity, of all things, is the hardest to be copied. —STEELE
In all things the supreme excellence is simplicity. —LONGFELLOW

WHAT COULD BE SIMPLER?

...AND THEREFORE MORE TROUBLE-FREE?

Examine an Allen-Bradley solenoid starter. See its simple construction —its few moving parts and absence of complicated mechanisms. Note its smooth operation. There are no pivots, pins, or bearings to delay switch action. These features account for the popularity of A-B solenoid starters among machine tool builders and buyers.

The Allen-Bradley solenoid starter has many other advantages, too. The double break, cadmium silver alloy contacts never require cleaning or filing. They are always in first class operating condition. The starter is unusually compact, too, yet it will easily disrupt currents of not less than ten times its maximum horsepower rating.

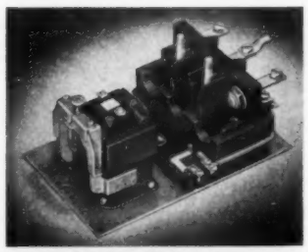
Installation is remarkably easy. The Allen-Bradley solenoid starter has generous wiring space, accessible terminals, white interiors, and many knockouts. Try this rugged motor starter on your toughest jobs.

Allen-Bradley Company

1310 S. Second St.
Milwaukee

ALLEN-BRADLEY
Solenoid Motor Control

A

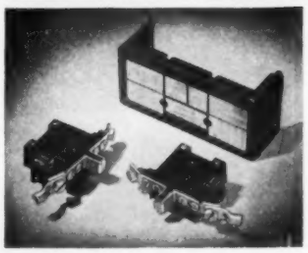


The basic Bulletin 709 solenoid starter mechanism. Fixed contacts, terminals, and operating coil are assembled on a sturdy metal base.

B

Solenoid plunger and movable contacts are the only moving parts. There are no bearings or pivots; operation is frictionless.

C



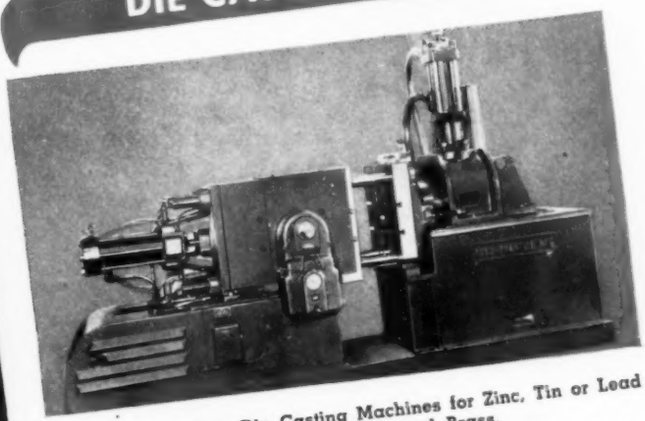
Above: Cover for the arc hood which encloses the double break, silver alloy contacts. Below: The reliable thermal overload relays.

MODERNIZE for PROFITS

with REED-PRENTICE

Reed-Prentice equipment is available in sizes and types to meet a wide range of demands in modernization programs. Our engineers can be of practical and valuable assistance in helping you plan for reducing costs in the tool room and on your production line. Ask us to study your problem and show you where and how you can profit from the many benefits assured by modern Reed-Prentice machines.

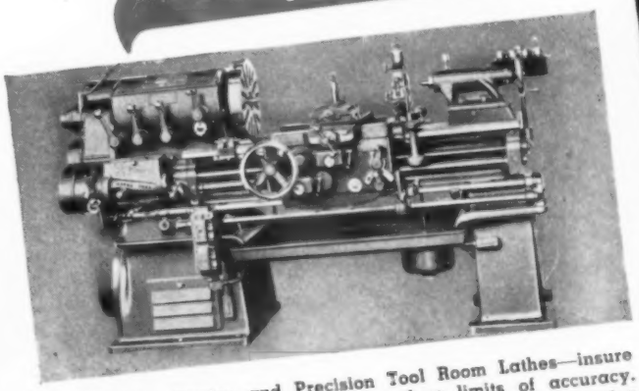
DIE CASTING



Reed-Prentice offers Die Casting Machines for Zinc, Tin or Lead Base Alloys, Magnesium, Aluminum and Brass.

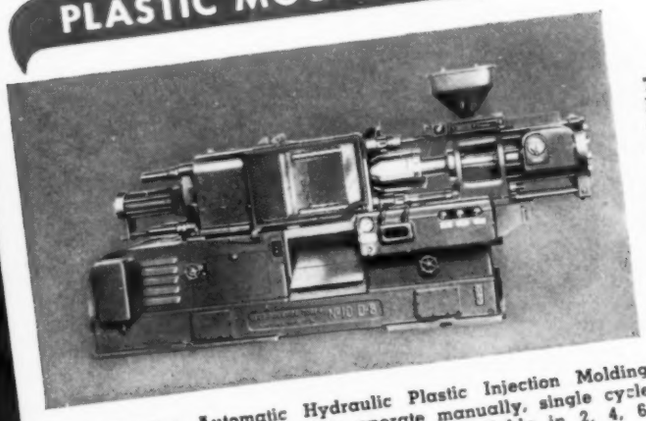
The No. 1½ Full Hydraulic Zinc Die Casting Machine shown, one of several sizes available, is provided with automatic electric control for semi-automatic operation. It can be furnished also for manual operation.

TURNING



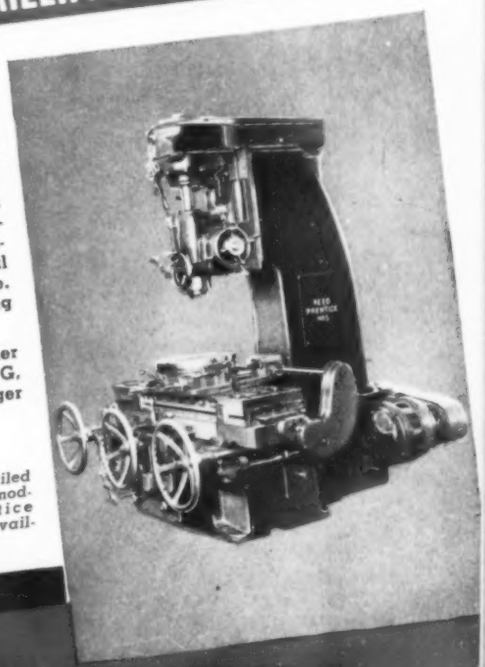
Reed-Prentice Engine and Precision Tool Room Lathes—insure smooth operation and fine work to close limits of accuracy. Designed for high spindle speeds and powered for tungsten carbide tools. Eight or 16 spindle speeds. Made in 14", 16" and 20" sizes.

PLASTIC MOULDING



Reed-Prentice Automatic Hydraulic Plastic Injection Molding Machines can be arranged to operate manually, single cycle or automatically. These machines are available in 2, 4, 6, and 8 ounce capacities.

MILLING & DIE SINKING



The improved No. 5 Reed Prentice Vertical Miller and Die Sinker is modern in every detail — accurate, fast and convenient—with helical gear drive to spindle. Also built as Jig Borer.

Made also in smaller sizes: No. 2V, 3-VG, 3 VSG and in larger size No. 6.

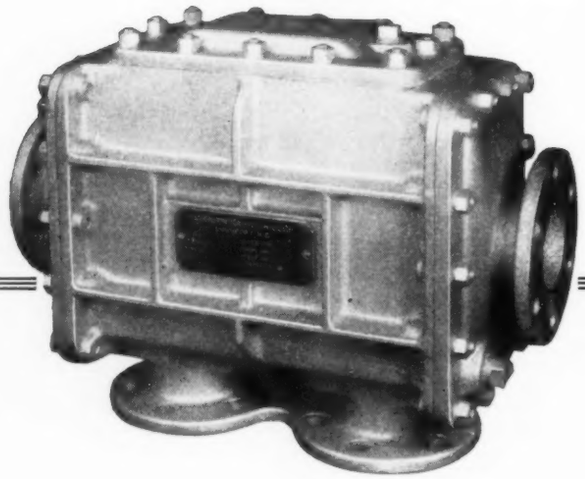
•

Complete detailed specifications on modern Reed-Prentice equipment are available on request.

REED-PRENTICE CORP.
MACHINE TOOLS
WORCESTER MASS., U. S. A.

Die Casting Machines
Plastic Injection Molding Machines
Lathes, Engine, Tool Room, and Production
Die Sinking Machines
Vertical Milling Machines
Jig Boring Machines
Special Production Machinery

Cool your cutting liquids and boost screw machine output



Speed up production on your automatic screw machines by controlling the temperature of the cutting liquid. Harrison cooling equipment is engineered to do this job for you—at reasonable first cost, low operating cost, and low maintenance cost. A request for recommendations regarding your specific requirements will receive immediate attention by Harrison engineers. Write today.

Here's what you accomplish

1 *Higher operating speeds—increased output.*

2 *Better quality of work—fewer rejections.*

3 *Longer intervals between tool dressing—easier maintenance.*

4 *Improved working conditions for operators — higher safety rating.*

HARRISON

HEAT EXCHANGERS

HARRISON RADIATOR DIVISION • GENERAL MOTORS CORPORATION • LOCKPORT, N.Y.

SHOP EQUIPMENT NEWS

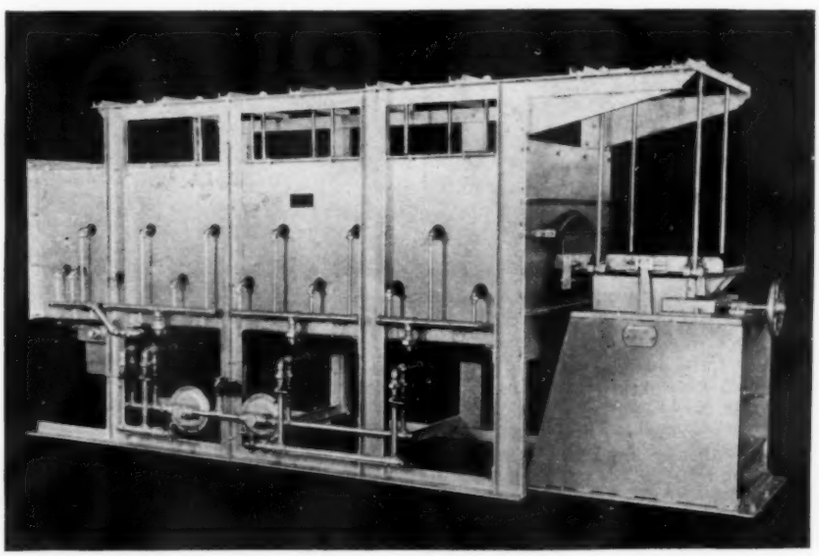
American Gas Furnace Company Announces Improved Continuous Clean Hardening Units

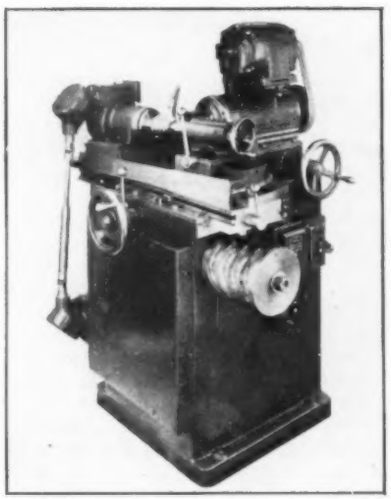
Having a capacity of 400 to 600 lb. of work per hour, the No. 191 continuous clean hardening machine made by American Gas Furnace Co., Elizabeth, N. J., eliminates conveyor troubles since all of the mechanism has been placed outside of the furnace proper. Either a full muffle or an open hearth is supplied with this machine. With the full muffle a ribbon flame seal is located at the work entering end and a special seal is arranged where the reciprocating muffle meets the stationary discharge chute, so that any desired atmosphere can be carried in it as, for example, that from a furnace gas atmosphere generator.

Where a special gas atmosphere is carried in the muffle, it usually is desirable to reduce the opening through which work enters to a minimum with a suitable sliding gate, and to eliminate the ribbon flame because of the discoloration which may result from its use. Where the atmosphere control need not be so exacting, these machines are supplied with an open hearth having high side ribs to eliminate any possibility of work dropping off into the combustion chamber. For long, thin pieces, the hearth or bottom of the muffle is grooved to insure such parts traveling with their long axis parallel with the hearth.

The motor drive is mounted complete in a separate extension, so that no vibration from it is transferred to the furnace. It consists of a 1200 r.p.m., 1½ hp. motor with an inclosed variable speed transmission and a speed reducer. A tension spring advances the muffle until it is stopped suddenly by the anvil on the top of the bumper framework. This spring tension is adjustable. The speed reducer operates a cam by which the muffle is returned to its original position. Length of stroke, number of strokes and force of the strokes all are adjustable.

Two controls are recommended for this machine. One at the charging end and one at the discharge end. In this way quick temperature response to changes in load conditions is obtained, and there is definite assurance that work is up to temperature when discharged. The thermocouple for the discharge end is so located that it registers the temperature accurately at this point, and so that the operator can at any time compare the appearance of the work with the temperature reading. A quenching tank is a separate but necessary adjunct to this machine. On the external discharge chute of the machine is provided a jacket through which the quenching oil or water is circulated, entering the chute through a slot at the back to form a cascade for efficient quenching to prevent splashing and burning of the oil in the quenching chute, eliminating any possibility of fire, and avoiding oil smoke and vapor backing up into the muffle.





Hunter Milling Lathe Cuts Irregular Spirals

Designed to cut conical spirals of increasing and decreasing pitches, and of irregular contour, the spiral milling lathe developed by Hunter Engineering Co., Blaine and Pachappa Sts., Riverside, Calif., indexes automatically for fluting operations. It will cut conics of compound angles and will machine a complete cutter as used on oil tool bits without attention from the operator. The machine will support work 10⅜ in. long between centers and will swing work up to 10 in. diameter.

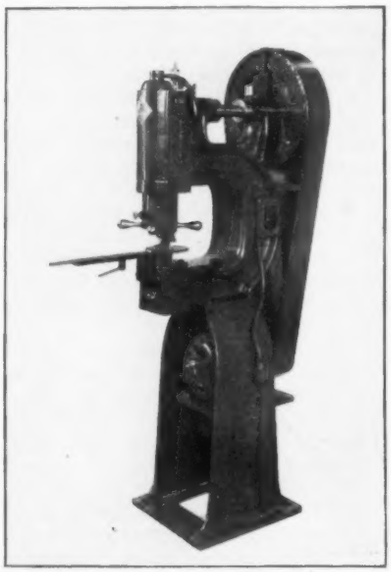
Designed primarily to meet the requirements of oil tool manufacturers, this machine is controlled by a master cam which produces geometric or abstract designs on the work. Also, there is a cam controlling the in and out feed of the spindle so that the depth of cut may be varied in order to obtain maximum strength in the cutter itself, and to obtain the proper tooth form. The cutter shown in the machine is milled with a lead of 3 in. for 180 deg. and then a reverse lead of 1½ in. for 180 deg. and so on around the cutter until it is completed. By various combinations of cams and gearing, the machine will cut single and multiple leads of increasing and decreasing pitches.

Height of spindle above floor is 49⅝ in.; the over-all height of the machine being 66½ in. Table has a working surface of 34 x 9¾ in. and has a 40 in. over-all length. The machine has a longitudinal power feed of 9 in., and a spindle cross feed of 4¾ in. Head and tailstock spindles are made from chrome nickel steel, heat-treated, hardened

and ground. Spindle drive is from a 3 hp. motor through multiple V-belts. Feed drive is powered with a ½ hp. gearhead motor, while the coolant pump is driven by a ¼ hp. vertical motor.

Improved Savage Nibblers Feature Revolving Heads

W. J. Savage Co., Knoxville, Tenn., recently has added new and improved features to their line of nibbling machines. A direct-over-center drive adds power to the machines while a totally inclosed revolving head simplifies operations. Fast and accurate cutting of sheets from 0 to ½ in. thick is accomplished by following a scribed line, freehand, or by using a guide templet. A tool holder and up-set head tool makes it possible successfully to cut stainless and other alloy steels, aluminum, brass, copper and other materials. Starting holes are punched under power. A removable steel material support plate is provided on machines having throat depth of 18 in. and more. A new nibbler has been added to this line. This machine has a capacity of $\frac{5}{16}$ in. in mild steel.



The revolving head feature on this machine permits handling 24 in. wide sheets of any length while cutting at any angle on a 360 deg. circle. Savage nibblers are built with cutting capacities in mild steel up to ⅞ in. and with throat depths of 9, 12, 18, 30, 34 and 36 in.

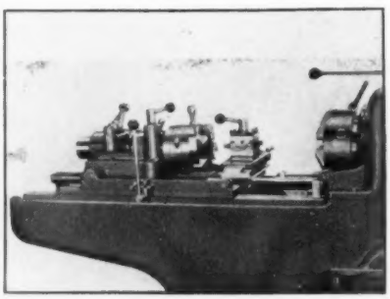
Eisler High Speed Welder Has Automatic Timer

The Eisler Engineering Co., 745 S. 13th St., Newark, N. J., has developed a 5 kva. high speed production spot welder. This vertical press-type machine is air operated and is equipped

with a suitable automatic timer and contactor. Two operators are required for this welder, one to load the welding fixture and the other to operate the foot switch and slide the fixture along after each weld. The objects shown in the photograph are cylindrical tubes to which small flat pieces of metal are being spot welded. The operator can attain a speed of 150 spot welds per minute.

Landmaco Threading Machine Reconditions Rock-Bit Rods

The Landmaco threading machine shown has been arranged by Landis Machine Co., Inc., Waynesboro, Pa., especially for reconditioning and



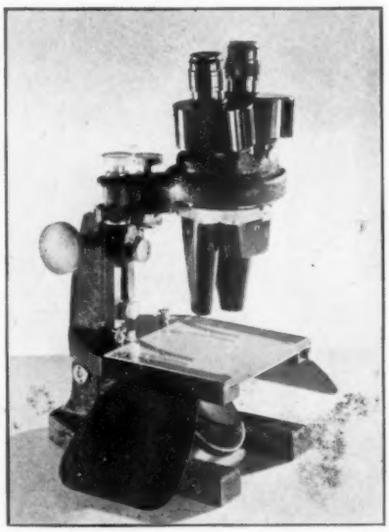
threading rock-bit rods. This machine employs a three-jaw universal chuck on the machine spindle instead of the conventional revolving type die head. The die head is mounted on a special carriage which is equipped with a tailstock into which is fitted the shank of a "Landmatic" die head. This shank has a sliding fit within the bore of the tailstock, permitting linear travel of the head. All threading operations are performed with a lead screw, which assures accurate lead control for the thread.

Directly in front of the die head, and located on the carriage, is a cross slide which supports a square turret. This turret can be fitted with turning, facing, forming and cut-off tools and can be turned easily to any desired position by loosening the center post clamping lever. A quick-acting clamp is provided on the side of the carriage to lock the entire assembly into position during cutting-off operations. Since the die head used is of the pull off type, provision is made for stopping the forward movement of the carriage. This stop is adjustable so that it can be synchronized with the leadscrew tripping mechanism and so that both operate simultaneously.

Improved Spencer Microscopes Provide Sharp Images

A series of improved stereoscopic microscopes is being introduced by Spencer Lens Co., Buffalo, N. Y. A vivid stereoscopic image that is easier on the eyes, a great depth of focus, a large object field, and a high degree of resolution of fine detail, giving critical sharpness to the image, are said to be the outstanding optical characteristics of these instruments. Equally notworthy are mechanical improvements which facilitate focusing on large or small specimens, and provide for quick changes in magnification. The objective lenses are held in a dust-proof revolving objective holder.

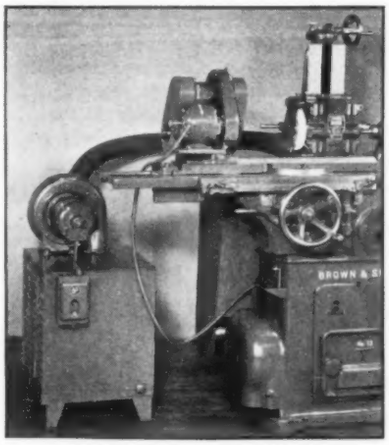
These instruments are offered in four different mechanical arrangements to cover a wide range of uses. Magnifications range from 6.3X to 144X. Seven different powers in paired objectives and four different powers in paired eyepieces provide a total of 28 different magnifications. The angle between the axes of the two elements of the paired objectives is 12 deg. In the prism boxes, each



line of light is bent 2 deg. toward the center, so that the convergence at the eyepieces is but 8 deg. This dual-convergence maintains the stereoscopic effect, yet makes it possible to work comfortably for long periods without eyestrain. Where it is desirable to move the microscope over a large area, special holding units can be supplied.

B. & S. Exhaust Attachment Fits No. 13 Universal Grinder

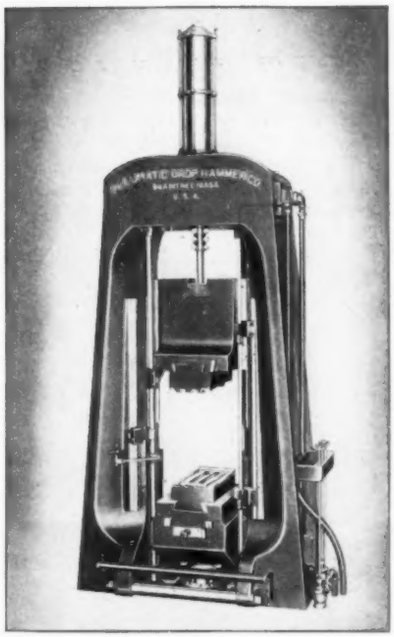
A motor-driven attachment designed especially for use on the No. 13 universal and tool grinding machine has been announced by Brown & Sharpe Mfg. Co., Providence, R. I. This attachment removes grit and dust-laden air from the region of the



grinding operation by suction and separates out the foreign matter, leaving the air clean. It is intended for use with straight and dish wheels, and may be applied at either end of the wheel spindle. The attachment includes an exhaust nozzle, flexible suction hose, and a dust collector unit consisting of a motor-driven fan mounted on a separator tank. Capacity of the attachment with a 3600 r.p.m. ¼ hp. motor is 300 cu. ft. per min. giving a velocity of approximately 6,000 ft. per min. through the 3 in. diameter hose.

Pneumatic Drop Hammer Features Double Action

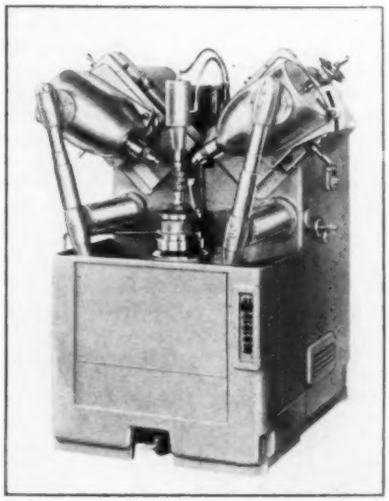
The double-action shockless drop forging hammer developed by Pneumatic Drop Hammer Co., 200 Adams St., Braintree, Mass., is claimed to operate without vibration since the opposing heads meet each other with the same force at impact. The dropping head is lifted by air and dropped by gravity, and, at the proper time in its descent releases the anvil head which is propelled upward to meet the dropping head. The motions of the two heads are reversed at impact and they then return to their



operating positions. Stroke adjustments are quickly and easily made. Parallel guiding members assure perfect register at impact, adjustable gibs being used to compensate for wear. Die adjustments can be made without moving the side frames. All movements of the hammer are controlled by the foot treadle.

Cross Gear Tooth Pointer Has Two Cutter Spindles

Power rapid traverse automatically advances both cutters into operating position when the No. 62 gear tooth



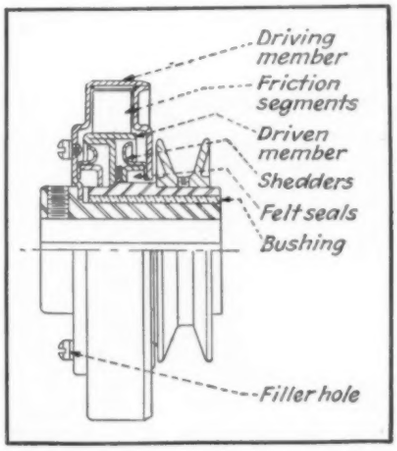
pointing machine developed by Cross Gear & Machine Co., 3250 Bellevue Ave., Detroit, Mich., is started. After the gear is pointed, both cutters automatically are retracted into the loading position. This gear tooth pointer is a universal machine, calibrated for ease of set-up and provided with standard change gears for indexing alterations. Motors and controls are built into the base with ample ventilation provided.

This No. 62 machine with two cutter spindles in angular relationship with the gear was developed especially for automotive helical gears that slide and now are pointed with an included angle of less than 90 deg., which results in easier, quieter shifting and less gear wear. One cutter cuts the bevel on one side of all of the teeth, while the other cuts the remaining bevel on the opposite side of all of the teeth. Specifications: gear diameter capacity, 10 in.; gear face capacity, 12 in.; gear pitch capacity, 4 pitch or finer; standard indexing range, 10 to 80 teeth; power rapid traverse, hydraulic; power transmission, through multiple V-belts; main drive motor, 5 hp.; hydraulic pump motor, 3 hp.; floor space required, 52 x 59 in.

Mercury Transmission Clutch May Be Used As Brake

The "Mercury" transmission clutch developed by Mercury Clutch Corp., Massillon, Ohio, permits a driving motor to gain speed before assuming load. Utilizing mercury to displace friction segments by centrifugal force, the clutch gradually picks up the load at full speed. Thus small motors may be used when starting under load. At present, 4 and 4½ in. diameter sizes are standard. These will transmit loads up to 5 hp. Other sizes are available on specification.

Only four principal parts comprise the clutch; the driving member or housing, the driven member or inner drum, the clutch segments and the mercury, the latter being introduced or removed through filler holes. In operation, mercury displaces the clutch segments inward, where they engage the drum at the proper time and speed, a positive drive being effected when the speed of the housing and driven drum are synchronized. It is possible to predetermine the



time or speed of engagement. Overloads and other shocks are not transmitted through the clutch to the prime mover, the capacity of the clutch limiting the torque transmitted. The unit operates equally well in a vertical or horizontal position, and it may be used as an automatic brake to become effective at a given speed. Where misalignment between the driver and load occurs, the clutch may be used as a flexible coupling while retaining its other properties.

Divine Polishing Lathe Made in Three Sizes

The Type VCS polishing and buffing lathe offered by Divine Bros. Co., Inc., Utica, N. Y., provides a distance of 40 in. between wheels, with a 52-in. spindle length. Wheels up to 4-in. face can be used on either end of the lathe. These lathes have a height of 38 in. from the floor to the center line of the spindle.

This can be reduced to 30 in. in the Model VCS-X lathe, which otherwise substantially is the same as the Model VCS machines. These lathes are available with 3-, 5- or 7½-hp. motors, which are mounted in the base of the machine. Drive from motor to spindle is by multiple V-belts, the three sizes of lathes taking two, three and four belts, respectively.

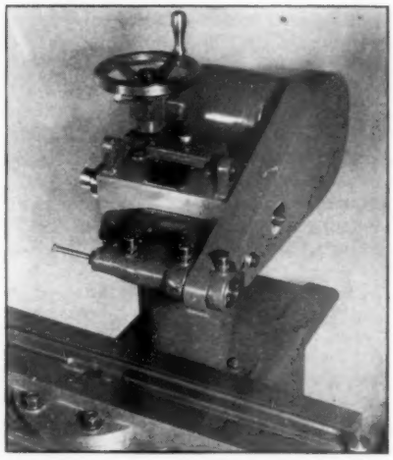
"Builders" Surface Grinder Features Novel Table Design

The Model T surface grinder announced by Builders Iron Foundry, 9 Codding St., Providence, R. I., features a table which rests on the plane ground surface of the bed and is guided both longitudinally and laterally by a T-square action control. This construction is claimed to make it possible to obtain unusual accuracy and finish, since there is no play to affect the thickness of the work and there is but one oil film subject to grinding pressure. Bed of this grinder is of box construction, and the column has three ground ways to which the saddle is clamped when in grinding position. To adjust the wheel roughly to position, the saddle clamp screw is loosened, so that the saddle can be moved with a minimum of effort. After reclamping the saddle to the ways, the final adjustment of

the wheel to the work is made by means of a micrometer handwheel which moves the spindle housing about its pivot in the saddle. The weight of the driving motor holds the spindle housing against the micrometer adjusting screw, eliminating backlash. A magnetic chuck measuring 8x4 in., or a mechanical fixture within the capacity of the machine can be furnished. This work fixture has provision for mounting the truing diamond. A ¼ hp. motor regularly is furnished to drive the spindle of this grinder. A 1/3 hp. motor can be furnished for greater stock removal capacity. The grinder will take work 8 in. long, 4 in. wide and 10 in. high under a 7-in. wheel. Feeds are by hand only. The bench machine requires a 44x32 in. bench space, and weighs approximately 305 lb. With floor column, the net weight is 490 lb.

B. & S. Internal Attachment Used on No. 10 Cutter Grinder

Designed for use in conjunction with the revolving spindle head stock, this internal grinding attachment developed by Brown & Sharpe Mfg. Co., Providence, R. I., permits the precision grinding of holes up to 2½ in. long and ½ in. minimum diameter in work of 6¾ in. maximum swing on the No. 10 cutter and tool grinder. The spindle runs at 22,500 r.p.m. and takes wheels ½ in. diameter, ¼ in. thick with a $\frac{3}{32}$ in. hole. A long, adjustable phosphor bronze bearing supports the spindle at the wheel end; and two double-row self-



aligning ball bearings at the pulley end take the pull of the flat belt. The attachment includes a height gage which, in conjunction with a finished pad on the bottom of the spindle housing, permits setting the spindle at exact center height. The unit weighs approximately 15 lb. and is furnished complete with belt, pulleys and steel guard.

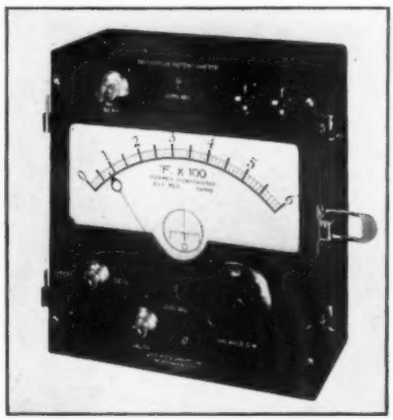
Vernon Vertical Machine Combines Miller and Borer

The "Vernon" combination vertical milling machine and jig borer developed by Machinery Mfg. Co., Dept. 10, P. O. Box 155, Vernon Branch, Los Angeles, Calif., has been designed especially for work on jigs, fixtures, dies and general milling operations. It can be used for laying out various jobs requiring high accuracy and can be equipped with dial indicators and measuring plugs for precise work. A profiling attachment can be used for duplicating work within the range of the machine.

The machine has a maximum dis-

tance of 10½ in. from the top of the table to the bottom of the spindle. The quill is arranged so that a slow feed is provided by handwheel, graduated to 0.001 in., or the slow traverse can be disengaged and a rapid one engaged by merely turning a knurled knob. The rapid one-to-one hand traverse greatly increases speed in drilling operations, also in milling out cavities for dies and similar parts. Spindle drive is equipped with back gearing and provides eight spindle speeds.

Specifications: over-all height of floor model, 71 in.; floor space required, 38 x 33 in.; height from floor to table top, 41 in.; maximum collet capacity, ½ in.; spindle speed range, 250 to 4,200 r.p.m.; table size, 6 x 21 in.; longitudinal table travel, 12 in.; cross table travel, 6 in.; movement of sliding head, 10½ in.; distance from center of spindle to column ways, 6 in.; quill travel, 3 in.; net weight of floor model, 700 lb. The bench model, without pedestal, weighs 500 lb. A ½ hp., 1750 r.p.m. motor is required to drive this machine.



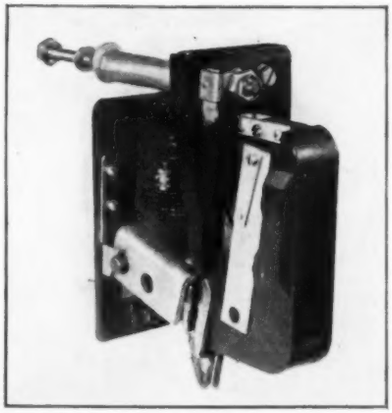
J-B-T Potentionmeter-Pyrometer Weighs less than 5 1-4 Lb.

The Model 70-PO portable potentiometer-pyrometer for measurement of temperature by thermocouples offered by J-B-T Instruments, Inc., 441 Chapel St., New Haven, Conn., is said to be easy to balance. It is designed to withstand vibration and adverse conditions of ambient temperature. It weighs less than 5¼ lb. This instrument uses no standard cell; the circuit requires only a flashlight cell.

The instrument can be used under ambient temperature conditions of −40 to + 120 F. The microammeter used features automatic cold junction compensation inside the case; no adjustments need be made for changes in room temperature. The 6¾-in. temperature scale may have a range up to 0–3000 F. Temperatures varying at such a rate that total scale is spanned in 10 sec. can be followed. Either single scale or double scale instruments are available.

Westinghouse Contactors Feature Several Improvements

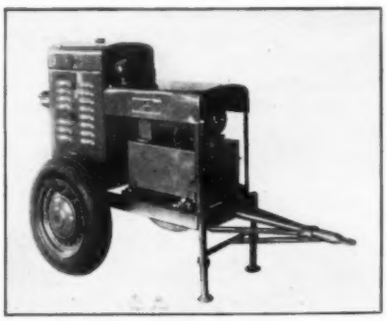
Series 200 Type SM improved heavy-duty d.c. magnetic contactors offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., feature increased armature overtravel, larger contact tips and nitrided bearings. Wearing depth of the contacts on all magnet closed contactors is increased approximately one-third by extending the armature overtravel, thus prolonging the life of the tips. The blowout coil now is brazed to the



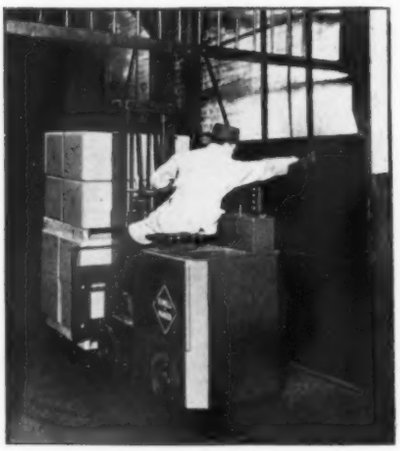
contact support and heating is reduced. Larger operating coils on magnet closed contactors provide increased pull with increased reliability. Bearing pin holes of the armature bracket are reamed so that "play" is reduced and centering is assured.

Comet Heavy-Duty Welder Driven by Gasoline Engine

This portable heavy-duty arc welder made by the Comet Products Co., Chappaqua, N. Y., can be used for mass production welding on a 24-hr. basis. A simple control of both cur-



rent and voltage is said to permit the operator to select quickly the best possible combination to meet the varying conditions found in modern welding practice. It is offered in 150, 200 and 300 amp. capacities driven by an air-cooled or water-cooled gasoline engine or with a diesel engine.

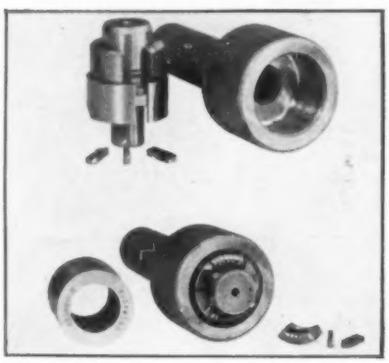


Elwell-Parker Power Truck Turns In 46-In. Radius

The "Cen-trol" power industrial truck offered by Elwell-Parker Electric Co., 4025 St. Clair Ave., Cleveland, Ohio, is designed especially to operate in cramped areas throughout the factory. It is able to make a complete turn in a 46-in. radius. It passes through doors 4½ ft. high, traverses plant aisles 48 in. wide, turns completely around inside a box car, and travels under load on plant elevators and up rams. The truck is equipped with forks and transports 2,000 lb. loads on pallets or skids. This is the smallest of a series of center control trucks recently introduced.

"New Method" Type Holder Marks Annular Parts

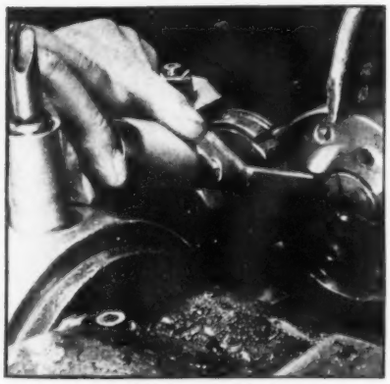
Setscrews to hold removable type in place are eliminated in this type holder developed by New Method Steel Stamp Co., 143 Jos. Campau, Detroit, Mich., for marking such annular parts as gears, bushings and bearings in quantity production. The holder consists of five basic parts; a central flanged shaft, against which is assembled a hardened and ground annular disk, a snap-ring in a groove machined in the shaft for locating the type during assembly through grooves cut in the type, and an outer spring-steel split sleeve which holds the type in place. Expansion of the



sleeve after assembly is impossible since the entire assembly is carried with a slip fit in the type holder body. The shaft shank of the inner assembly is ground with an angular flap to provide a positive locking device. To mark a part, the holder merely is placed on or against the part with the shaft in the bore of the piece. The end of the holder then is given a sharp blow with a hammer.

H & H Diamond Lap Hones Fit Reciprocating Tools

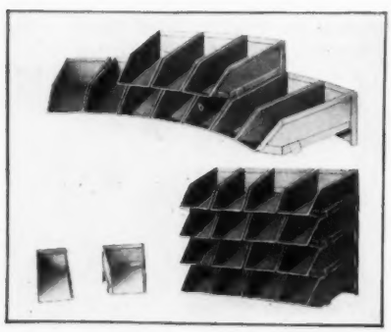
Diamond-lap hones in any grit from rough-cut to 500 grit have been made available by the H & H Research Co., 1925 W. Buena Vista, Detroit, Mich., especially for use in "multi-purpose"



reciprocating electric tools. These hones art set $\frac{1}{32}$ or $\frac{1}{16}$ in. thick and 1 in. long on the face of the body. They are recommended especially for honing the cutting edges of carbide-tipped tools; also for finishing operations on dies and molds.

Large Stackbin Units Used on Assembly Benches

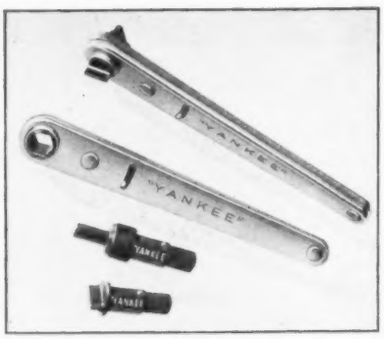
The large size assembly bin offered by Stackbin Corp., 42 Troy St., Providence, R. I., is 12 in. long, 4 in. deep, 5 in. wide at the front and 6 in. wide at the back so that it can be used to hold larger parts than formerly was possible. As in the previous,



smaller size, the contents are fed towards the front by a sloping floor. This bin is large enough to allow entrance of the assembly worker's hands. These bins can be used on any assembly bench; can be set up in a semi-circle and stacked one above the other to keep important parts immediately accessible.

North "Yankee" Screwdrivers Are of Offset Ratchet Type

North Bros. Mfg. Co., Philadelphia, Pa., have introduced four offset ratchet screwdrivers under the "Yankee" trade name. The series includes



assorted adapters and has a wide range of use with both slotted and hollow screws. The No. 3400 screwdriver is $3\frac{15}{16}$ in. long and is furnished complete with three blades, two ratchet and one rigid. The No. 3800 tool is of heavier construction, measures $4\frac{3}{4}$ in. long, and has two blades of different dimensions. The No. 3600 unit is an offset ratchet handle for use with interchangeable adapters in work with smaller screws. No. 3900 screwdriver is an offset ratchet handle of heavier construction for larger screws. Adapters fit into hexagonal opening and are held by a friction ball. Certain adapters contain flatted screwdriver blades for use on slotted screws; others are fitted with hexagon ends for driving hollow-head screws. All adapters have knurled spinner tops for quick starting of loose screws.

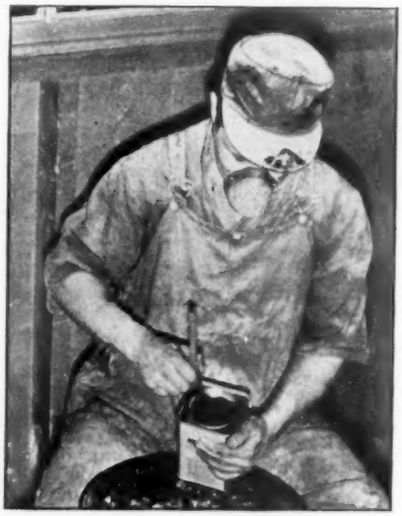
Russell Shaded-Pole Motors Have High Efficiency

High locked rotor and accelerating torque, in combination with high electrical efficiency and large output per unit weight, is claimed for a line of ball-bearing, shaded-pole motors brought out by the Russell Electric

Co., 370 W. Huron St., Chicago, Ill. Differing from most fractional horsepower motors, these motors do not depend on the stator for alignment. This is accomplished by the use of die-cast end frames with a spacer shell held in compression by through bolts. The bearing system and alignment is independent of the thickness of the stator. These motors will operate in any position and will withstand substantial end thrust. Self-aligning, semi-oil-less sleeve bearings also are available. Power output ranges from three to fifteen watts. The a.c. motors are of 4-pole design with a top speed of 1600 r.p.m.

A.O.C. Filter Respirator Weighs Only 1 1-2 oz.

Development of a light-weight respirator to protect against dust, pollen and bacteria has been announced by the American Optical Co., Southbridge, Mass. Weighing only 1½ oz., and excluding particles as small as a micron (1/25,000 in.), the device was developed by W. H. Lehmberg to provide comfortable protection for those working in dusts; persons allergic to pollens causing hay fever and asthma; and doctors, nurses and pa-



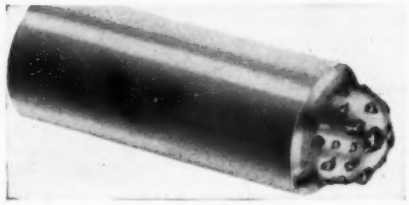
tients exposed to certain air-borne bacteria. The effectiveness of the respirator is due to a new method of making the filter unit, an improved exhalation valve, a self-equalizing double headband which holds the respirator securely against the face; and a facial design which enables one to wear the device with comfort.

Durakool Mercury Relay Features Sealed Contacts

The unbreakable mercury relay offered by Durakool, Inc., 1010 N. Main St., Elkhart, Ind., uses the unbreakable metal body of the Durakool mercury switch and the displacement principle with solenoid actuation. The contact structure is hermetically

Advertisement

Carboloy Wheel Dresser Saves 18c Per Dressing



Users of diamond dressers have found that the Carboloy diamond-impregnated wheel dresser permits the use of diamonds for dressing grinding wheels but eliminates many unfavorable factors commonly encountered in the use of ordinary, single-diamond dressers.

On one application reported, a saving of 18c per dressing was made with a Carboloy wheel dresser. The job was dry dressing a 20 x 6 aluminous oxide wheel used for rough grinding laminated steel cores of electric motors. The diamond-impregnated Carboloy dresser replaced a 3 carat diamond and reduced the cost from 21½c to 3½c per dressing.

Carboloy dressers give greater diamond usage per carat, eliminate all remounting expense, stand abuse, and save at least 25% in dresser costs. Used for rough, semi-finish, and finish dressing operations. Send for catalog DR- 38.

Carboloy Dies Extrude 215,000 Feet of Abrasive Resistor Dough

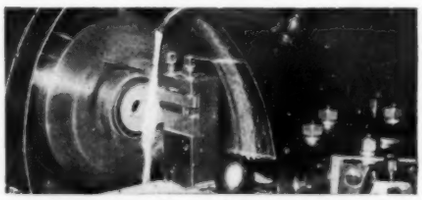
This application of Carboloy cemented carbide to resistor extruding dies is indicative of the high wear resistant qualities of this metal when applied to parts on machines subject to localized abrasive wear.

On this application Carboloy dies extrude about 215,000 lineal feet of stiff, abrasive, resistor dough, out-wearing 215 hardened steel dies, whose life averaged 1,000 feet of this material.

This is a small part of the overall saving, however, as the operator now puts in all his time doing productive work instead of changing two steel dies during each batch. Moreover, the quality of production is better because of better control of diameters, and closer control of production.

40% of All Carboloy Jobs At DeWalt Are Steel Cutting

Typical of the general purpose use of Carboloy tools in the DeWalt Products Corporation, Lancaster, Pa., is this facing of a steel plate arbor collar. Operating at 381 feet



per minute, .065" feed, ⅛" cut, the Carboloy tool used stands up for the lot of 250 pieces and is still in good condition. 40% of all Carboloy operations at DeWalt are on steel. Through the carefully planned, general-purpose use of Carboloy, DeWalt have successfully applied this cutting material to 80% of all machining operations in their plant.

☆ Again! . . . General purpose use of Carboloy Tools on Small-lot diversified work . . . PAYS DIVIDENDS!

DeWalt Did it!

And STEPPED-UP MACHINING PRODUCTION 65%

DeWalt Products Corp., Lancaster, Pa. Producers of "Flexible - power" Woodworking Machines and other cutting equipment.

Machine shops seeking a practical way to apply Carboloy tools broadly on small-lot, diversified work will find useful the method employed by DeWalt Products Corporation, Lancaster, Pa., on this type of machining work.

In machining the parts for DeWalt high speed cutting equipment for wood, metal, stone, etc., lots range from 20 to 100 pieces, metals machined are cast iron, semi-steel, and aluminum. To apply Carboloy tools profitably on such limited-quantity work, it is usually necessary that each tool be designed for wide application.

To meet this requirement, the DeWalt tool supervisor reviewed a typical cross-section of the machining work passing through the shop, particularly noted frequency with which similar machining operations occurred. From this study, 6 general purpose Carboloy tools were designed to do the bulk of the work. Problem of carbide grade selection was simplified by using one general purpose grade for cast iron, one for steel.

Here's How—
6 general purpose styles of tools, using 2 general purpose Carboloy grades do bulk of work in DeWalt plant.

Starting with this basic procedure, Carboloy general purpose tools have been applied to approximately 80% of all jobs in the shop. 40% are on steel; 60% on cast iron and aluminum. It has resulted in a 65% average increase machining production, according to C. L. Boughter, Supt.

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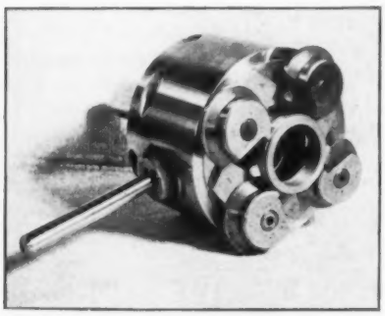
★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE ★

sealed making the relay suitable for use in corrosive or explosive atmospheres. It may be operated up to 300 times per minute. There is little friction and no wear in operation. The metal body is treated to hold a gas at a pressure of four atmospheres. Contact resistance is as low as 0.002 ohms. On a.c. as little as 1 watt is required for normal closing operation, and only 1.5 watts for normal opening operation. On d.c. the operating energy required is but 0.25 watts. This relay is available for requirements up to 200 amp. capacity.

National Acme Heads Used for Hollow Milling

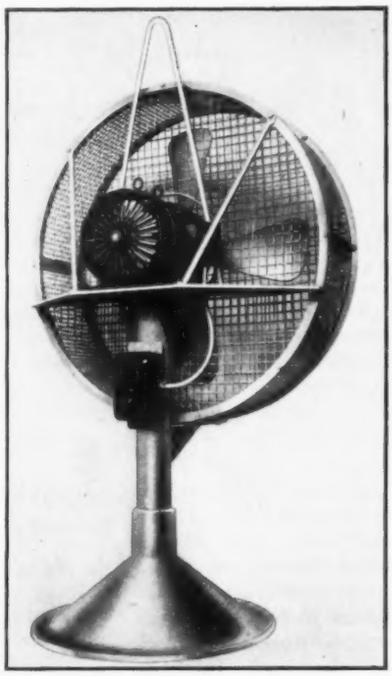
Since the original announcement of hollow milling heads about a year and a half ago, the National Acme Co., 170 E. 131st St., Cleveland, Ohio, has broadened the scope of these tools considerably. A complete line of end turning, end forming, combination turning and threading cutters of the circular type now are available for use in standard circular chaser die heads. One head can



be used both for threading and for hollow milling jobs. Typical examples of hollow milling applications are valve stems, formed gasket seats, upset pipe and a wide class of work having several body diameters and round nose ends. Tools for reaming, facing, beveling or chamfering operations also may be inserted in the heads so that these operations can be performed at the same time as the regular forming and turning cuts. Change from threading to hollow milling or vice versa requires only a change of holding blocks and cutters in the same head. These heads are supplied for both revolving and non-revolving spindle machines in sizes from ¼ to 13⅜ in.

Truflo Man Cooling Fans Are Easily Portable

A series of portable man cooling fans, which are available in sizes ranging from 12 to 36 in. diameter, has been announced by The Truflo Fan Co., 557 Main St., Harmony, Pa. Illustrated is a 36-in. unit which is 48 in. high to the center line of the fan wheel and has a 32-in. diameter cast iron base with a 4-in. pipe stand. A ¾ in. round steel bar is welded to the motor base and bolted to the top guard for handling with



overhead cranes. This fan employs a 3 hp. motor and the total weight of the unit, including the stand, guard and propeller, is 356 lb. A four-blade solid case aluminum propeller is used.

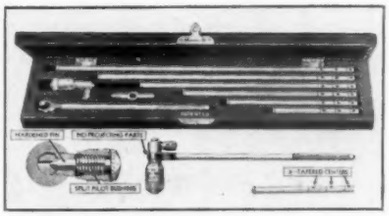
Cullen-Friestedt Lifter Handles Annealing Boxes

The Cullen-Friestedt Co., 1313 So. Kilbourn Ave., Chicago, Ill., has designed the lifter shown in the accompanying illustration, especially for handling annealing boxes. This unit, which is an adaptation of the standard sheet steel lifter, was primarily designed to eliminate warping of annealing bottoms when being handled hot. This is accomplished by the use of a continuous angle, which engages the bottom, in place of the previously used prongs. Warping is said to be greatly reduced, prolonging the life of the annealing bottoms and covers. The lifter can be operated by one

man. Over-all height of the unit is held to a minimum, allowing the lifter to pass over other boxes on the floor. The lifter shown has 30-ton capacity and is operated by hand. It may be arranged for power drive if desired.

Pacific Inside Mikes Are Set to Size Quickly

The "International" inside micrometer offered by Pacific Specialty Supply Co., 344 N. Vermont Ave., Los Angeles, Calif., is available with two groups of measuring rods. Set No. 4A has a capacity from 1½ to 12 in. with seven measuring rods, while set No. 4B measures from 1½ to 6 in. with three measuring rods. Each rod is marked with its length and is held to the head by means of a locating screw which locks into the center of the rod. The centers can be located easily by means of lines on the rod. All rods have three centers spaced ½ in. apart to a high degree of accu-



racy, giving a range of 1½ in. to the rod, thus minimizing rod changing. All rods and the micrometer head have hardened points ground to the proper radius. They can be adjusted quickly for wear.

Binks Spray Line Marker Completely Self-Contained

The No. 240 spray line marker offered by Binks Mfg. Co., 3114-26 Carroll Ave., Chicago, Ill., is a self-contained portable spray unit for marking traffic lines in warehouses, mills, factories and other locations. The unit is suitable for one-man opera-

NEW IDEAS for NEW DAYS

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Release your turret lathes and other machines for more important work, by using the "RAPIDUCTION JUNIOR" Threading Machine on your second operation jobs. It's an idea worth thinking about and the "RAPIDUCTION JUNIOR" with its ability to handle all sorts of special threading work, speedily and accurately, is an economical way to increase the productivity of your high priced equipment. *Be sure to get details from*

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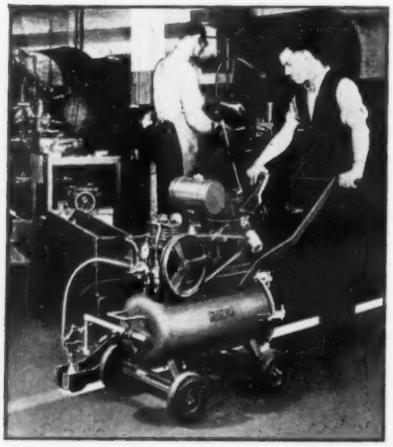
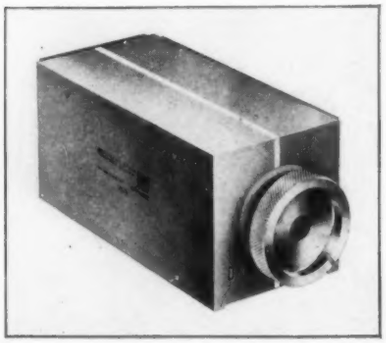
tion and will lay down a stripe from 2 to 6 in. wide at the rate of one to four miles per hour, depending on the condition of the pavement or floor. It is equipped with a ¾ hp. gasoline engine, and has four pneu-



matic tires. The operator has a clear view at all times of the old stripe or the guide lines laid down. A 12-gal. material pressure container keeps the spray gun supplied with material.

B. & S. Magnetic Block Useful to Toolmakers

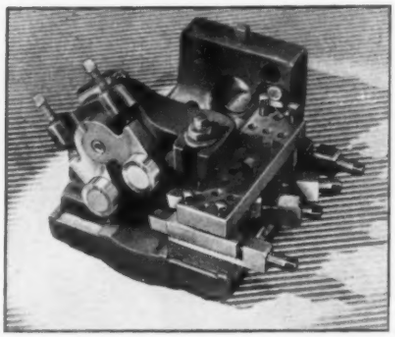
Measuring 2½ x 5¼ in., this permanent maget type toolmakers magnetic block is suitable for many jobs that usually require special, cumbersome clamping arrangements. In toolmaking, inspecting or manufacturing, the convenient size of this No. 760 block makes it a useful tool. When the knurled control wheel is turned "on", work is held firmly on the block and, if the block rests on a conductive



surface, it also is held firmly to this surface. Work and block both are released when the control wheel is in the "off" position. Holding power can be regulated by giving the control wheel a part turn, so that work can be removed from or positioned on the block without removing the block from the conductive surface. Magnetic pull on the end of the block permits it to be used, also, in an upright position on a conductive surface. The block measures 2$\frac{13}{16}$ in. wide, 2½ in. high and 6$\frac{5}{16}$ in. long.

Multiple Cutter Turner Developed by Gisholt

An improved multiple cutter turner for turret lathes has been announced by Gisholt Machine Co., 1201 E. Washington Ave., Madison, Wis. This turner will make several reducing cuts simultaneously on bar stock. Among the design features which are said to contribute to its ability to make heavy high-speed cuts and still maintain accurate dimensions and fine finish are its rigid steel construction, hardened steel rollers mouned on roller bearings, and adjustable roller arms that attach securely to the block. Set-up operations are facilitated by micrometer adjust-

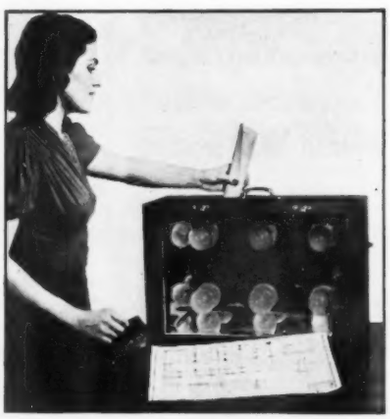


ment screws on the tool blocks. All moveable parts are adjustable for wear and are enclosed to exclude chips and dirt. This turner is available in several sizes for diameters as small as ¾ in. and as large as 4¾ in.

Ozalid Portable Printer Reproduces Small Drawings

The "Elpro" portable printer offered by Ozalid Corp., Ansco Rd., Johnson City, N. Y., has been designed to use positive printing, dry developing, Ozalid sensitized papers and cloths. It is claimed that it will reproduce engineering drawings, letters, reports, maps and other items having pencil or ink lines, typewritten or printed matter appearing on one side of a reasonably translucent sheet.

The light source in this printer consists of six special lamps. The



case is finished in gun metal and a highly polished aluminum reflector assures uniform light distribution over the printing surface. The dry developing chamber, which is located behind the metal reflector, uses the heat generated by the lights to vaporize the developing agent. A time switch allows the operator automatically to regulate the length of exposure, thus eliminating guess work.

Cleveland Wall Cranes Are Of Welded Construction

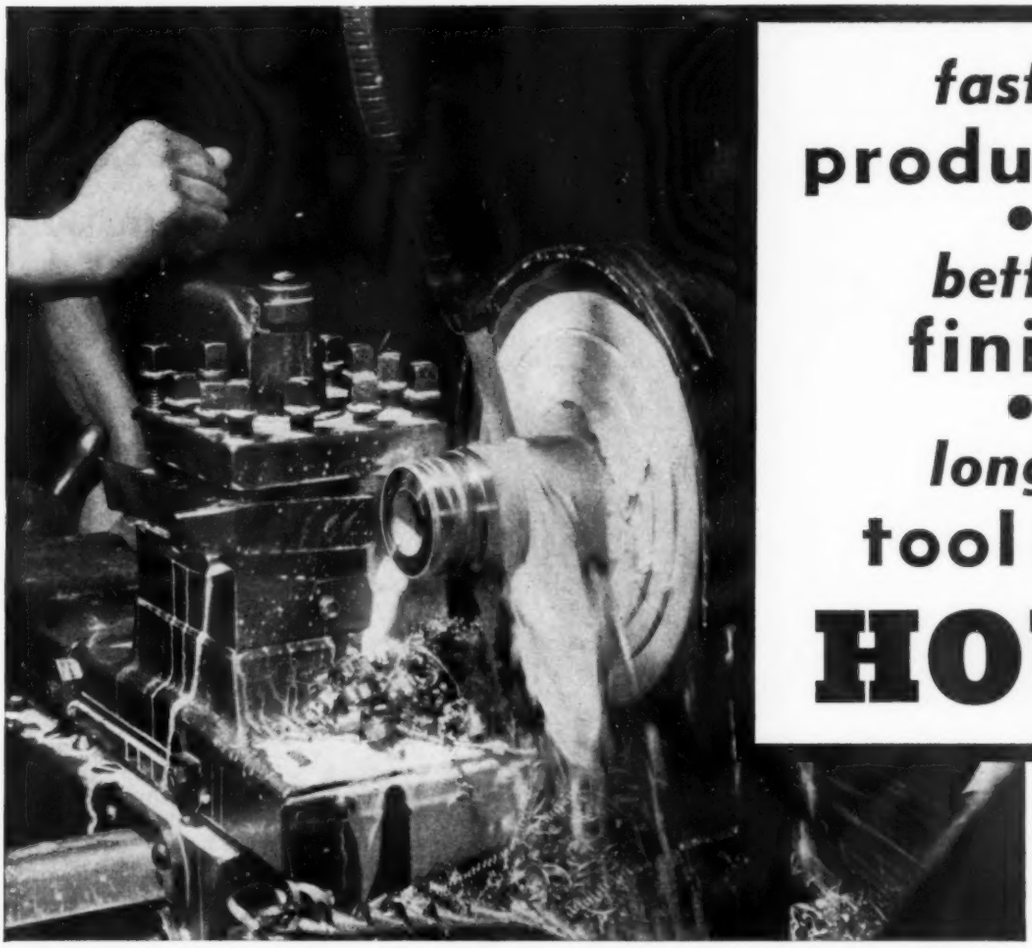
The Cleveland Crane & Engineering Co., Wickliffe, Ohio, recently furnished six wall-type cranes of interesting construction to the Navy Department for use at the Norfolk Navy Yard. These cranes have a horizontal reach of 30 ft. from center of hook to center of runway rails. They have a capacity of five tons at 20-ft. reach and three tons at 30-ft. reach. Total lift is 22 ft. Jib travel speed is 200 ft. per min., trolley speed is 75 ft. per min., and hoisting speed is 30 ft. per min. Four motors are

used; two for the jib travel and one each for the other motions.

The cranes are of all-welded steel construction with roller bearings throughout. Six wheels are provided for the jib travel; two for the vertical loading, two at the base of the crane for the wall compression loading, and the two upper wheels for the wall tension loading. Jib travel is by means of two individual duplicate drive units which operate simultaneously. Magnetic control is provided for all motors. Control is from a floor-operated pushbutton station.

Paege Trammel Features Positive Point Adjustment

The Paege trammel, developed by Reinhold Paege, 14872 Ilene Ave., Detroit, Mich., consists of a 30-in. wooden beam of special cross section, two brass bodies with holes in the corners for steel points and knurled brass rollers held against the trammel beam with steel springs. A third body, with holes for common size round or hexagon pencils is included. The V-shaped back of each body fits on the V-shaped back of the beam and is held tightly by the spring in the roll on the front of the beam. The V-shape of the beam and body prevents any wobbling between body and beam. Adjustments are made simply by rolling the knurled rolls



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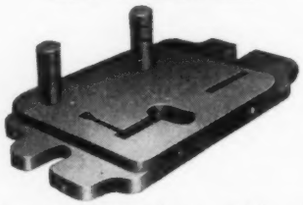
STOP "BLACKSMITH" METHODS

Use a DoALL



This part 12½" long, 7¼" wide was sawed from 1 3/16" cast iron on the DoAll in exactly 30 minutes. Formerly, it was drilled, chipped and filed, requiring 6 hours.

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Contour Sawing, the new DoAll process of machining is recognized as the fastest precision method of removing metal; cuts out internal and external shapes from any metal up to 10" thick.

Does work of 3 machines. DoAll is a moderately priced, rugged precision machine tool that replaces shaping, milling and lathe work on a large variety of jobs with enormous savings.

Used in large and small plants in 30 countries by such firms as General Electric, Ace Tool & Die, U. S. Navy, Picatinny Arsenal, Kokomo Spring, Mergenthaler Linotype, Ford, Fisher Body, John Wood Mfg. Co., Continental Scale, etc.

Let a factory trained man bring a Do-All to your plant and show you what it does, what it saves on your own work.

FREE —
New Handbook on Contour Machining—158 pages of valuable metal working helps.

CONTINENTAL MACHINES, INC.
1310 S. Washington Ave. Minneapolis, Minn.

☐ Send data on the DoAll AM-5
☐ Send Free Handbook

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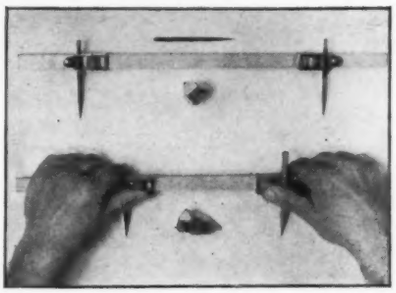
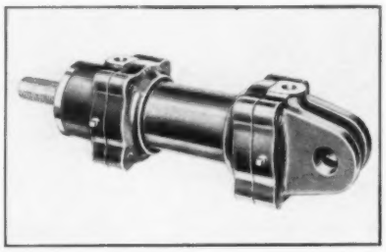
Address.....



by thumb. Steel points or pencils are attached to the bodies easily. It is simply necessary to press the spring down and insert the point or pencil. The trammel can be used for inside or outside calipers, simply by changing the points.

Hannifin Hydraulic Cylinders Made for Swivel Mounting

Two standard swivel mounting type high-pressure hydraulic cylinders have been announced by Hannifin Mfg. Co., 621 S. Kilmar Ave., Chicago, Ill. Model BN cylinder is a high-pressure unit with a small diameter piston rod. The Model B2N unit has



a two-to-one differential piston rod. Either model is available with an adjustable cushion on either or both ends. The swivel mounting illustrated is in addition to six other standard types of mountings available. Universal end caps may be positioned independently to bring inlet ports at top, bottom or either side. Either cap may be moved without disturbing the cylinder mounting or any other parts.

Five Spray Assemblies Used With DeVilbiss Unit

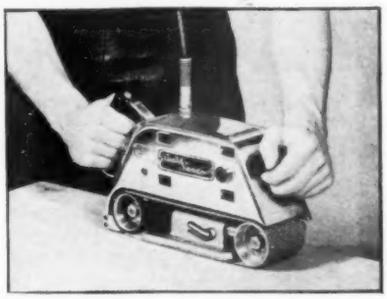
A series of small spray-painting outfits has been announced by the DeVilbiss Co., Toledo, Ohio. This NCB line of five different spray equipment assemblies is built around an improved ¼ hp. electric motor driven air compressor. Three are cup gun outfits and two include a pressure feed paint tank of two gallon capacity.

The air compressing unit is composed of a ball bearing piston-type compressor direct connected to a standard ¼ hp. motor. These, together with the air strainer, crank case and pulsation chamber, form an integral unit inclosed in a streamlined housing. Rated displacement is 4.3 cu. ft. per min. at 40 lb. pressure. Actual air delivery at this pressure to 2.6 cu. ft. per min. at a maximum pressure of 50 lb. The NCB outfit

illustrated includes a pressure feed spray gun with a 1 qt. cup and 12 ft. of ¼ in. braid covered air hose.

"GuildSander" Uses Standard Three-Inch Abrasive Belts

The Type G-3 GuildSander offered by Syracuse GuildTool Co., 1720 No. Salina St., Syracuse, N. Y., uses standard 3-in. wide and 24-in. long abrasive belts. With a belt speed of 1,350 ft. per min., this tool is suitable for sanding and surfacing operations on wood, metal, marble, slate, plastics and other compositions. Equipped with a ½ hp. universal motor, it operates on any 110 volt a.c. or d.c.



line. All moving parts, including the drive and idler pulleys, are equipped with precision ball bearings. Weighing only 15 lb., this sander is suitable for both bench and floor jobs of all types.

Westinghouse Fluorescent Lamp Produces White Light

A 58-in. long, 85-watt Type RF fluorescent lamp producing white light, and designed especially for industrial service, has been announced by the Lamp Div., Westinghouse Electric & Mfg. Co., Bloomfield, N. J. These lamps may be operated on either 105-125 volt or 210-250 volt 60 cycle a.c. in special equipment which provides direct current through the use of a rectifying device. The white and the blue-white lamps are interchangeable in single and twin fixture units made for their use. Color of light produced by the new white lamp

is somewhat like that of the daylight Makda F fluorescent lamp, and is suitable for use where color discrimination is important. Light output is about the same as that of the blue-white unit, rated at 4,250 lumens.

Photoswitch Pilot Control Operates on Light Pressure

Photoswitch, Inc., 21 Chestnut St., Cambridge, Mass., has developed the "Pilot Control" electronic switch to make possible control of large currents by delicate mechanisms, liquids, or extremely light contact pressure normally not capable of being used to control electric current. Control is effected by the delicate touching of two fine wires or contacts, or by their being short-circuited by a liquid or even any moist material. Only three millionths of an ampere may in this way control any current desired.

Atlantic Grinding Wheels Finish Precision Tools

Atlantic Abrasive Corp., 516 Pearl St., South Braintree, Mass., has announced the development of two wheels for difficult precision grinding involved in finishing high speed steels and similar metals.

Type LB wheel is made for fast, clean cutting on tools or dies. A synthetic bond is used to eliminate heat and prevent clogging or glazing. This wheel is available in all grain sizes from coarse to fine, with the latter recommended for grinding cast iron and alloy pistons, and for precision grinding of all steels.

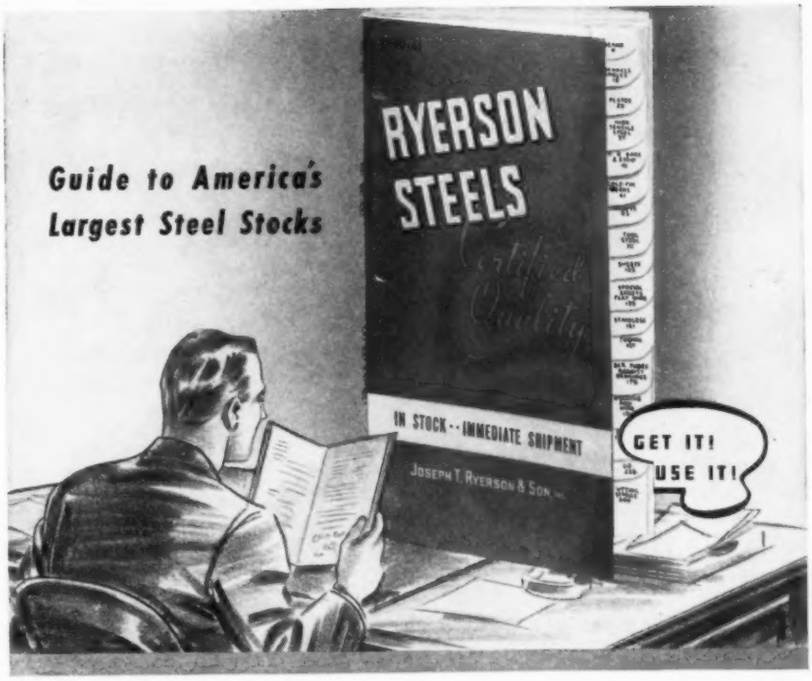
Type SB wheel, which also comes in all grain sizes, is a medium tempered wheel for grinding fine tools made of high-speed steel, stellite, carboloy and other carbides. This wheel permits maximum working speed and pressure without danger of burning.

Wesson Carbide Tools Available in Standard Types

A complete line of standard carbide cutting tools has been announced by Wesson Co., 1050 Mt. Elliott Ave., Detroit, Mich. These tools include reamers, shell reamers, core drills, end mills, counterbores, and inserted-blade milling cutters. A feature of these tools is their hardening at temperatures which do not injure the bond or the carbide insert.

Trumbull Magnetic Starters Feature Compact Design

A compact magnetic starter which combines a motor circuit disconnect and a magnetic starter in one unit, for use on motor circuits from 1 to 25 hp., 600 volts a.c., has been made available by the Trumbull Electric Mfg. Co., Plainville, Conn. This



THE NEW RYERSON STOCK LIST

speeds—and simplifies—steel buying

New products . . . new analyses . . . new sizes . . . more reference tables and helpful charts . . . improved mechanical features—all combine to make the new Ryerson Stock List an outstanding manual for steel users. Whatever your need in steel and allied lines, you can rely on the Ryerson Stock List as a dependable guide to Immediate Stock Shipment of uniform high quality products.

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Cold Forming Plates, Inland Hi-Steel Cold Rolled Stretcher Leveled Sheets, Pluramelt Stainless Steel Sheets, SAE 4815 Hot Rolled Alloy Rounds, W. D. X4130 Hot Rolled and Cold Rolled Rounds, and SAE X4340 Hot Rolled Alloy Rounds are among the new products listed in this new book.

Handy Reference Tables and Charts

SAE Standard Specification tables, physical properties charts, showing physical properties and machinability, ratings of over 50 steels, weight tables, numerical equivalent charts and other important data are included in the 1940 Ryerson Stock List.

Complete Description of Many Lines

Over 10,000 kinds, shapes and sizes of Certified steel are shown. These include structurals, bars, plates, sheets, cold finished steels, heat treated alloys, tool steel, high tensile steel, stainless, mechanical tubing, babbitt metal, welding rod, reinforcing bars, bolts, nuts, rivets, etc.

Improved Mechanical Features

In addition to an enlarged product index, the new book has an improved thumb tab margin index. Eye-conditioned paper assures easy reading. A new type of mechanical binding has been adopted so the book will lie flat and pages turn easily.

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Have your machines spend less down-time for adjustment! Countless hours are saved . . . for production . . . from first assembly to the end of bearings' life . . . by simply peeling adjustments of .002 or .003 inch from the solid laminated brass shims. No filing or costly precision grinding!

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starter is arranged for convertible fusing and front operation. Interchangeable heaters are available for the starter, while automatic reset is provided for the disconnects. Two and four pole assemblies are available. The control handle has a three-position action, quick-make and quick-break—interlocked in "on" or "off" position. Third handle position is marked "open cover." Only when the handle is in this position can the cover of the starter be opened.

American Coverglas Goggles Protect Wearers of Glasses

No. 323 Duralite Coverglas goggles offered by American Optical Co., Southbridge, Mass., have been developed especially to provide dependable, comfortable protection for gas welders who must wear glasses for correction of vision. This goggle fits snugly over any style of spectacle and protects the eyes from flying sparks and scale, light rays and glare. The light-weight goggle is fitted with Noviweld lenses, which are chemically compounded to protect against glare and invisible infra-red and ultra-violet rays. Other features include improved ventilating louvres which keep the eyes cool and the lenses clear, yet exclude light; and especially shaped eye-cups made of a durable, moisture-proof composition.

General Electric Capacitor Improves Resistance Welding

The gradually increasing size of resistance welding machines has introduced the problem of power supply to users of this equipment. For this service the General Electric Co., Schenectady, N. Y. has developed a series-capacitor system consisting of a capacitor equipment connected in series with the transformer primary of the resistance welding machine, and of the proper rating to improve the power-factor of the welding circuit to approximately unity. This equipment can be applied to spot, projection, seam and butt resistance welding. It is used with both synchronous and non-synchronous control.

NEW MATERIALS

Truscon "Non-Slip" Paint Recommended for Floors

"Safe-T-Step" is the name of a rubber-base paint combined with an abrasive offered by Truscon Laboratories, Inc., Box 69, Milwaukee Junction P.O., Detroit, Mich. Applied with a brush, this paint is said to take the "skid" out of floors of all kinds. It is claimed to bond perfectly with an old coat of paint, if in sound condition. It requires no special preparation of the floor aside from ordinary care in having the surface clean, dry and free from oil and grease at the time of application. It dries within four or five hours; may be walked on the next day under good drying conditions. Available in concrete grey, tile red, Spanish green, and linoleum brown colors.

Durez 1905 Compound Has High Impact Strength

Durez Plastics & Chemicals, Inc., Walck Rd., North Tonawanda, N. Y., has announced development of Durez 1905 black phenolic molding compound, with an impact strength of 0.6 (A.S.T.M.) and a heat-resistance of 418 F. Unusually high gloss for high-impact compounds is reported with this material. It is available only in the new particle size which is designed for free flowing through feeders and hoppers to simplify the production of preforms.

TRADE PUBLICATIONS

BAR MACHINES National Acme Co., 170 East 131st St., Cleveland, Ohio, has made available the first edition of its handbook for operators of Acme-Gridley multiple-spindle bar machines. Priced at 50 cents per copy, is contains 124 pages of design, engineering and operating data, illustrations of various shop set-ups, and other useful information.

BEARINGS Johnson Bronze Co., 515 So. Mill St., New Castle, Pa., offers 76 pages of information in Catalogue 400, claimed to be the most complete ever published on bearing bronze.

BEARINGS A 16-page illustrated catalog describing "Metaline" oilless bronze bearings has been issued by R. W. Rhoades Metaline Co., 50-17 Fifth St., Long Island City, N. Y.

CONTOUR SAWING Continental Machines, Inc., 1310 Washington Ave. S., Minneapolis, Minn., has compiled in an attractive loose-leaf binder a number of case histories showing how the contour sawing method has cut time and cost on various types of work.

CONVEYORS Ajax Flexible Coupling Co., Westfield, N. Y., provides information concernnig a line of vibrating conveyors and feeders in a 4-page illustrated bulletin, No. 29.

DIE HEADS Eastern Machine Screw Corp., 20-40 Barclay St., New Haven, Conn., has issued three bulletins describing insert-chaser die heads. Bulletin No. 10 contains 4 pages discussing savings achieved by the use of insert-chaser die heads, bulletin

No. 11 describes the Style MM die heads for rotary die spindles, while Bulletin No. 12 discusses stationary die heads.

DRAFTING Details of an extensive line of vertical drafting machines and adjustable drawing boards are provided in a 36-page illustrated booklet available from Emmert Mfg. Co., Waynesboro, Pa.

ELECTRICAL EQUIPMENT Catalog No. 30-000, available from Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., contains 59 pages describing many types of switches and protective devices for motor and lighting circuits.

FINISHING Binks Mfg. Co., 3114-40 Carroll Ave., Chicago, Ill., has made available its 104-page 1940 catalog and data book. Identified as Catalog No. 75, it provides design and performance data on all types of spray painting and finishing equipment.

FLAME CLEANING "Flame Cleaning and Dehydrating," an 8-page illustrated booklet available from Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y., discusses uses of this process in forestalling paint flaking on structural steel.

FORGINGS Acme Machinery Co., 4535 St. Clair Ave., Cleveland, Ohio, provides 20 pages of illustrations and information concerning the Model XN forging machine, in a bulletin entitled "Acme Modern Forging Machines."

GEAR CUTTING A folder now being distributed by Cross Gear & Machine Co., 3250 Bellevue Ave., Detroit, Mich., illustrates design and operating features of the No. 60 continuous rotary-cutting gear tooth pointing machine.

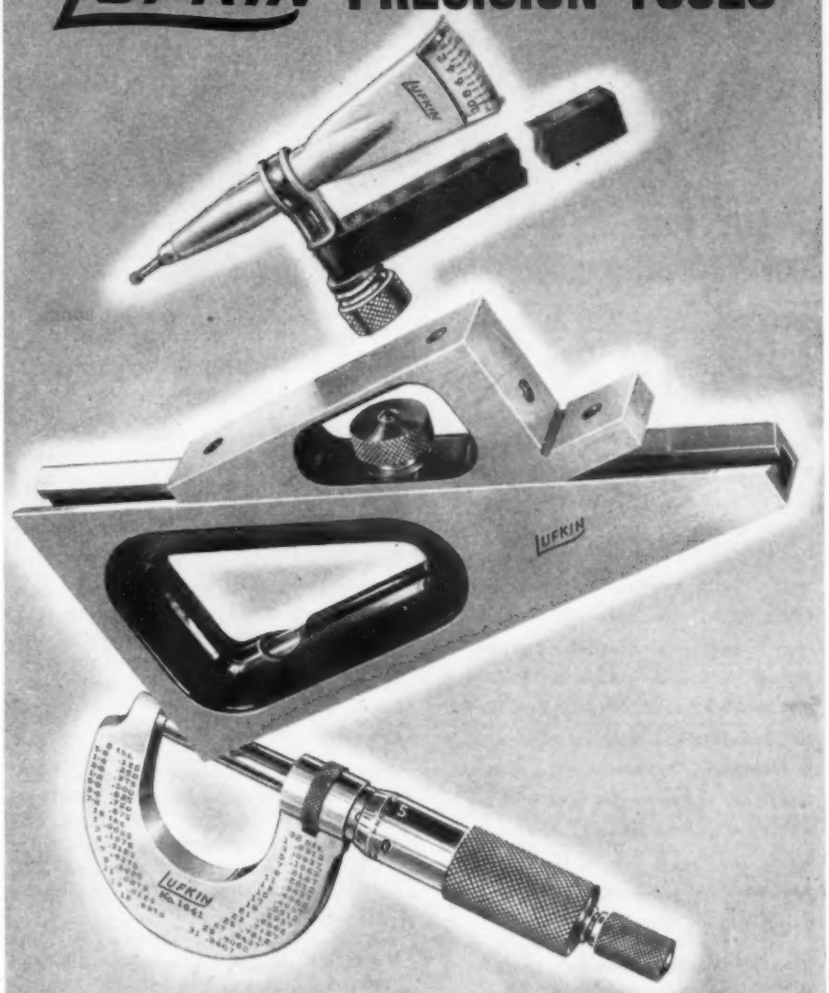
GEARING An engineering manual providing technical data on cone-drive worm gearing has been made available by the Cone Worm Gear Div. of Michigan Tool Co., Detroit, Mich.

GEARS Fellows Gear Shaper Co., 78 River St., Springfield, Vt., has published a 64-page illustrated loose-leaf book describing its various production processes. Entitled "The Fellows Method", this book details uses and applications of Fellows cutters, gear shapers and other equipment for cutting, finishing and testing gears of all kinds.

HOISTS Sullivan Machinery Co., Michigan City, Ind., describes its Class L-111 reversible "Pistonair" single-drum hoists in Bulletin No. 76-R.

HOISTS Bulletin No. 344-A, issued by the Shaw-Box Crane & Hoist Div. of Manning, Maxwell & Moore, Inc.,

UP-TO-DATE MACHINISTS
USE
LUFKIN PRECISION TOOLS



To keep abreast of the fast moving industrial pace, machinists the world over are depending on up-to-date Lufkin Precision Tools for the speed and critical accuracy they need. If you'll refer to the new catalog that illustrates and describes these many advanced tools you'll see why. A copy will gladly be sent you upon request.

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TAPES — RULES — PRECISION TOOLS

KEEP YOUR WELDING COSTS DOWN WITH MUREX

GENEX

The SPEEDY, EASY-TO-USE ALL-PURPOSE ELECTRODE FOR STRAIGHT POLARITY OR A. C. WELDING.

Designed for welding in any position... flat, vertical, or overhead...and to readily bridge gaps where assembly fit-up is imperfect, Murex Genex Electrodes have several outstanding features which make them highly economical in operation. They are used at higher currents, which steps up welding speed. They burn with less spatter; less smoke, and so provide better visibility of the arc and the molten pool of weld metal. The slag is easy to remove and does not cling to the edges of the weld, even on heavy fillets.

Send for complete information, or ask to have a representative call and show you what these electrodes can do.

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Investigate Thermit Welding, too—in use since 1902 for heavy repair work, crankshafts, etc.

Muskegon, Mich., contains 4 pages providing illustrations and specifications of the "Budgit" line of portable electric hoists.

INSTRUMENTS Catalog No. 1125C, published by C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., contains 24 pages of features and specifications of the complete "TAG" line of industrial thermometers.

LAPPING Bulletin 13991, issued by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich., contains 4 pages of information concerning features of a line of thread lapping machines.

MAGNET WIRE 92 pages of engineering specifications concerning "Anaconda" magnet wire and coils are provided in the second edition of Anaconda Publication No. C-352, available from Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.

MICROSCOPE Design and operating features of a precision toolmakers' microscope are provided in an 8-page illustrated bulletin, No. 147, issued by Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago, Ill.

MOTOR PARTS Motor parts for built-in universal motors of 1/150 to 1 hp. where motor housing is an integral part of driven appliance are discussed in booklet F-8495, issued by Dept. 7-N-20, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MOTORS End-mounted motors for air filters, blowers, sirens and other applications requiring this style of mounting are discussed in leaflet No. F-8493, available from Dept. 7-N-20, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MOTORS Bulletin No. GEA-1798A, issued by General Electric Co., Schenectady, N. Y., provides four pages of information concerning the features of Type M and MT wound-rotor induction motors of 1 hp. and larger.

PLATING A 4-page folder issued by Nukem Products Co., 70 Niagara St., Buffalo, N. Y., discusses "Basolit" leakproof compounds for plating tanks.

PLANER DRIVE Details of the variable-voltage type of reversing planer drive are provided in an illustrated folder, No. GEA-3285, issued by General Electric Co., Schenectady, N. Y.

PORTABLE GRINDERS Circular No. P-20, issued by Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., discusses "Bantam" rotary air grinders.

PUMPS John S. Barnes Corp., 301 S. Water St., Rockford, Ill., has issue two pamphlets describing the PA 20 Series of gear pumps and the PA 14, 16, 17 and 18 Series of piston pumps.

"ROTOSHAVING" National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich., has issued a 6-page illustrated folder outlining the "RotoShaving" process and providing several examples of its applications.

SAFETY A news bulletin explaining recent improvement in "Ful-Vue" safety goggles is offered by American Optical Co., Southbridge, Mass.

SCREW MACHINE OPERATION National Acme Co., 170 E. 131st St., Cleveland, Ohio, has published a 124-page loose-leaf handbook for screw machine operators. Profusely illustrated, the book is offered free to Acme-Gridley operators only.

SHEARS Bulletin No. 80-C, issued by Niagara Machine & Tool Works, 637-97 Northland Ave., Buffalo, N. Y., provides 16 pages of illustrations and information concerning a line of foot-operated squaring shares and hand-operated circle shears.

STEEL The Advertising Div. of Republic Steel Corp., Cleveland, Ohio, has made available the fourth edition of "Steel Handbook for Machine Tool Users." Identified as Steel Handbook No. 39, the volume contains 80 pages and includes tables of recommended cutting speeds and feeds for many grades of carbon, alloy and stainless steels.

THREADING Bulletin No. E-88-1, issued by Landis Machine Co., Waynesboro, Pa., contains 8 pages of information concerning the 4-spindle semi-automatic threading machine.

TURRET LATHES Jones & Lamson Machine Co., Springfield, Vt., has issued three new catalogs describing features of its line of turret lathes. One deals with ram-type universal turret lathes Nos. 3, 4 and 5, another discusses the saddle-type universal turret lathes Nos. 8A, 8B and 8D, while the third deals with saddle-type universal turret lathes Nos. 7A, 7B and 7D. Each contains 24 pages and is profusely illustrated.

WELDING Tentative specifications for iron and steel arc-welding electrodes approved by both the American Welding Society and the American Society for Testing Materials are included in a 24-page catalog issued by McKay Co., York, Pa.

WELDING Design features and specifications of the "Hornet" arc welder are provided in a 16-page illustrated bulletin issued by Wilson Welder & Metals Co. and distributed by Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.

NEW BOOKS

MACHINE SHOP WORK—*By Frederick W. Turner, Oscar E. Perrigo and Aldrick Bertrand. 412 pages. Published by American Technical Society, Drexel Ave. at 58th St., Chicago. $2.75.*

Mr. Bertrand has recently completed a thorough revision of the previous editions of this book which is now issued in its fifth edition. The new edition sets forth a comprehensive treatise on approved shop methods, including construction and use of tools and machines, details of their efficient operation, and a discussion of modern production methods. The book provides an excellent textbook for the student. It is illustrated with photographs and line drawings.

•

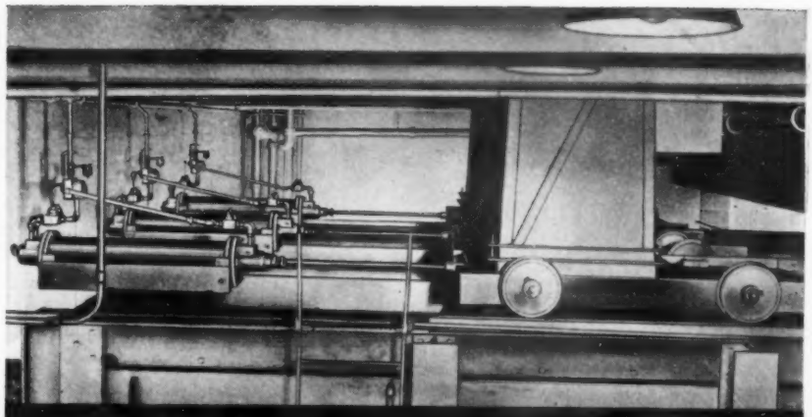
HUMAN-RELATIONS MANUAL FOR EXECUTIVES—*By Carl Heyel. 253 pages. Published by McGraw-Hill Book Co., 330 West Forty-Second St., New York City. $2.*

This book, written by the manager of the Conference Planning Division of the American Management Association, is designed to give quick pictures of what companies in all types of industry have done and are doing in handling the human problems involved in selecting people, training them, getting along with them, making them work efficiently. The author has successfully adopted the practice of passing along to the reader a good idea which has worked in one line of endeavor on the theory that it often can be applied in another, with the right kind of modification. There are chapters on such subjects as developing first-line supervision, making work easier, making work safer, paying people, dismissing people, and improving understanding between management and employees. The book is written in a style easy to read. It constitutes a good "working" guide for those concerned with personnel problems.

•

PUBLIC SPEAKING FOR TECHNICAL MEN—*By S. Marion Tucker. 397 pages. Published by the McGraw-Hill Book Co., Inc., 330 West 42nd St., New York City. $3.*

Mr. Tucker, who for several years gave a series of talks on public speaking for technical men before the American Society of Mechanical Engineers, gives down-to-earth advice on how to speak effectively. Many technical men are called on to give papers before technical societies, to participate in the affairs of those societies, and to speak before various groups. The author tells how to overcome nervousness as a speaker, how to appeal to the audience from the beginning of a talk, platform mannerisms which are good and bad, how



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Are Experts in Lowering Production Costs!

Hundreds of plants know from experience why Curtis Air Cylinders step up production operations and cut costs of former old fashioned methods. They're designed to give you faster, smoother, more accurate and efficient handling of material, gates, presses, doors—in fact almost any push, pull or lifting operation can be done better with Curtis Air Cylinders. They're experts at their jobs.

Curtis Air Cylinders are surprisingly economical. Initial cost, power cost and upkeep are all exceptionally low. They cannot be damaged by overloading and are practically immune to abuse, exposure and atmospheric conditions that ordinarily deteriorate other equipment.

Curtis valves are packless, self-grinding and provide extreme accuracy and delicacy of control, yet Curtis Air Cylinders operate so simply that unskilled labor can easily handle them at work.

You'll save money wherever Curtis Air Cylinders can be used in your plant. Write for our new 28-page booklet, "How Air Is Being Used in Your Industry," and complete information on Curtis air operated equipment.

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Please send me booklet "How Air Is Being Used in Your Industry" and data on Air Cylinders.

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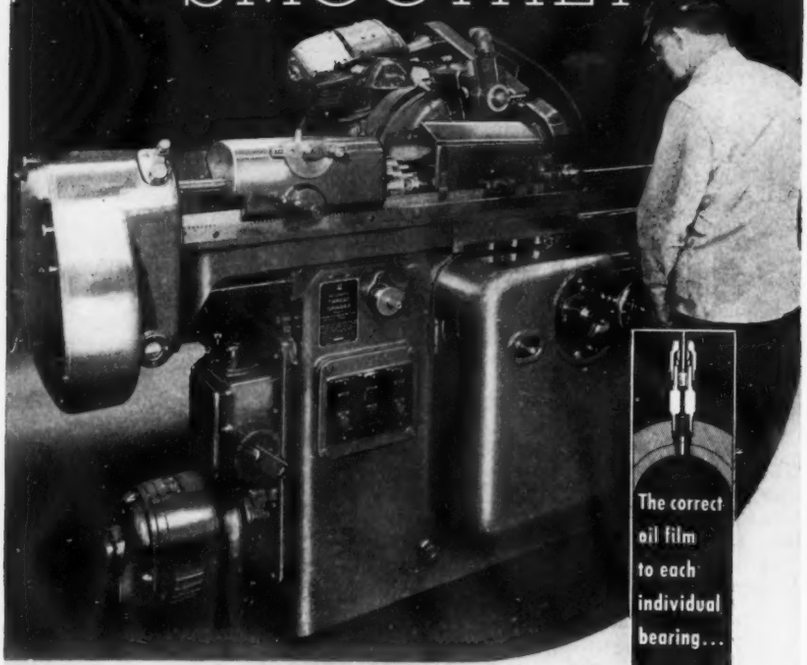

"JONES & LAMSON" Automatic Thread Grinder . . . with all bearings except grinding wheel spindle Bijur-lubricated.

● No time is lost from productive work . . . a BIJUR-equipped machine oils itself, while running! Metered oil-feed—the correct oil-film needed by each individual bearing—is supplied automatically. The efficiency of operator and machine is raised . . . precision standards are held . . . maintenance is reduced to a minimum . . . production stepped up!

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AUTOMATICALLY *Correct* LUBRICATION

1385

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ARE AUTOMATICALLY
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1441

to use your voice, how to organize a speech and how to speak over the radio. The book is well worth the reading time of anyone who from time to time must get on his feet and express his thoughts.

•

STRAIGHT FROM THE SHOULDER. *Ormont Publishing Co., 30 Vesey Street, New York, N. Y. $2.50.*

If you have to make a speech, or for that matter like to browse through sayings which are witty and philosophical, this book will be a big help. You will find many good quotations. The subject matter is of wide range.

TO THE EDITOR

Fewer Machines?

Dear Sir:

The writer was quite interested in your editorial entitled, "Backward, Turn Backward."

To carry the analogy a little further and to bring it closer home to Senator O'Mahoney, we suggest the following questions:

Why not eliminate that nice little electric railroad that runs in the tunnel between the Capitol and the Senate Office Building, and get 50 or 75 wheel chairs from the boardwalk at Atlantic City, with, of course, a man behind each chair to push? What if it would take a little longer to get over to the Senate Office Building and back? What if the Senator couldn't do as much work in as little time as he now does? What if he couldn't be as efficient? It would put more men to work, wouldn't it?

Yours very truly,
L. C. BLAKE, *advertising manager*
Curtis Pneumatic Machinery Co.

More Preparedness Needed?

Dear Sir:

The airplane has brought a new concept to the word "timeliness." Why should we be contemptuous of British unpreparedness is beyond me—have a look at ourselves. We may not have a year to prepare next time. There are too many means available to a prepared enemy for striking swiftly. Don't misunderstand me. Let's stay out of this mess until it properly concerns us. Yet we should be able to make our decision as a strong nation rather than as an unprepared one. Today, only a strong nation can afford to be a peaceful one. No. I didn't have raw beef for breakfast.

Yours truly,
A. A.

What do other readers think about how far we should go as a nation to be prepared these days for whatever may come?—Ed.

What

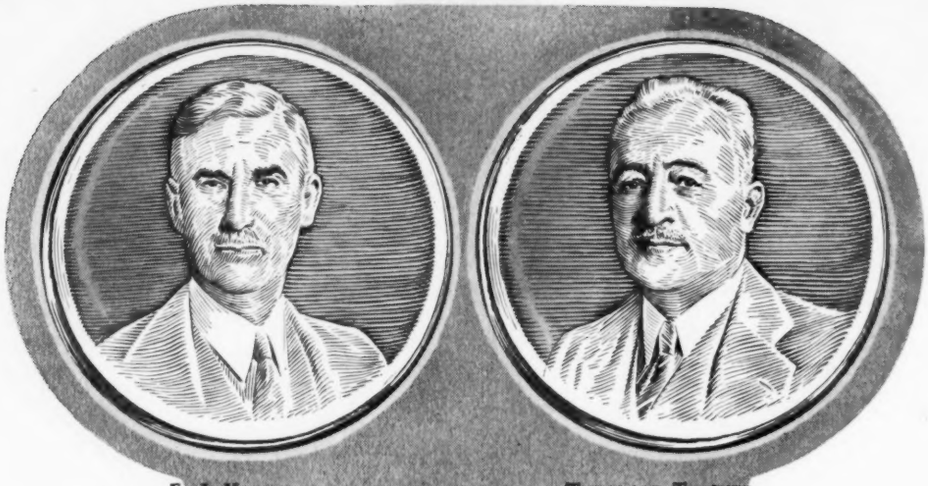
KEARNEY & TRECKER

CORPORATION

BUILDERS OF MILWAUKEE MILLING MACHINES
HAS CONTRIBUTED TO AMERICAN INDUSTRY

A 42 YEAR RECORD

. . . of achievement culminating in the world's largest plant devoted exclusively to the manufacture of milling machines.



E. J. KEARNEY THEODORE TRECKER

KEARNEY & TRECKER CORPORATION

Chronicle of Progress

MILWAUKEE MILLING MACHINES

1899 • 1919

12 Employees in 1899

653 Employees in 1919

ALL GEARED FEED BOX . . . The first improvement on the conventional double-cone feed change type of milling machine.

SOLID TOP KNEE . . . Provides greater rigidity and improved support of table.

AUTOMATIC FLOODED LUBRICATION . . . Assures complete lubrication of internal mechanism.

FLANGED SPINDLE END WITH HARDENED DRIVE COLLAR . . . Another forward step in the design of milling machines.

ALL GEARED SPINDLE DRIVE . . . A revolutionary advance — a positive drive that delivers full power to the spindle at all speeds.

COOLANT RETURN AND TELESCOPIC SLIDE . . . A clean and practical means for returning cutter coolant from table to reservoir.

DOUBLE OVERARMS . . . The best means of supporting the arbor ever devised.

1919 • 1929

653 Employees in 1919

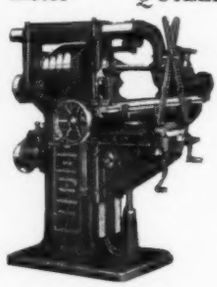
904 Employees in 1929

PRODUCTION SERVICE . . . A division of the Kearney & Trecker organization developed to serve the growing need of industry for single-purpose tooling.

MOTOR-IN-BASE MACHINES . . . The first standard milling machines with the important "motor-in-base" feature.

POWER RAPID TRAVERSE IN SIX DIRECTIONS . . . For increased production.

THE MILWAUKEE SIMPLEX . . . A bedtype machine with a flexibility of operation never before available.



An Early Model Milwaukee Milling Machine.

THE MILWAUKEE DUPLEX . . . A two-spindle bedtype machine of wide range and adaptability.

DOUBLE SPINDLE HOUSING . . . Gives added rigidity to both Milwaukee Simplex and Duplex machines.

QUILLED SPINDLE . . . Increases the range, rigidity, and versatility of bedtype machines.

UNIT CONSTRUCTION . . . Permitting the assembly of standard units to fit each customer's requirements.

LOW LEAD ATTACHMENT . . . Over 40,000 different leads by power.

1929 • 1939

904 Employees in 1929

1352 Employees in 1939

T-C MILLING... Pioneering in the application of tungsten and tantalum carbide to milling cutters. Extensive research resulted in completely redesigned machines.

SOLID BACK COLUMN . . . Additional rigidity — reduces vibration.

CENTER BEARING SPINDLE . . . Increases stiffness of spindle eight times over conventional mounting.

SPONSON TYPE KNEE... Provides proper distribution of metal in this important member.

CROSS MOUNTED MOTOR... Assures easy access to motor from both sides — permits machine to be placed against wall or partition.

SLIDING HEAD VERTICAL... A machine of many refinements —including complete lubrication — spindle drive gears mounted solidly on spindle.

HYPOID DIVIDING HEAD . . . A new type of dividing head of exceptional performance accuracy with 5 to 1 ratio for quick indexing.

ASTRONOMICAL DIVIDER . . . For super-precision work, divides a circle into 1,296,000 parts — or one second of arc.

SAFETY CONTROLS . . . Interlocking mechanism provides complete safety for the operator.

PUSH BUTTON STATION ON STARTING LEVER . . . The logical place for the push button. A simple development but basically important.

FULL VISION REAR CONTROL . . . Important controls in full view of the operator.

PROTECTO MESH . . . Means for rapid and safe changing of spindle speeds.

HYDRAULIC CONTROLS . . . Hydraulic controls of clutch and brake with front and rear operating positions.

LOUVRE VENTILATION OF COLUMN AND KNEE . . . To prevent condensation.

ROTARY HEAD TOOL AND DIE MILLING MACHINE . . . A new development in tool and die milling machines, with sensational possibilities for reducing costs.

UNIVERSAL HEAD VERTICAL MILLING MACHINE . . . Added versatility and range for the swivel-head vertical type of milling machine.

1940

2431 Employees May 1, 1940

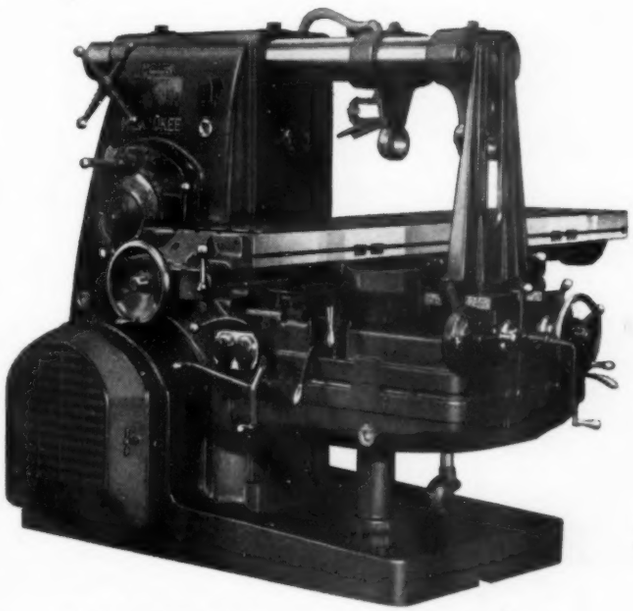
5H PLAIN, UNIVERSAL, AND VERTICAL MACHINES . . . Newly designed, heavy duty machines, that operate with the ease and simplicity that, up to now, could be expected only in lighter milling machines.

(Scheduled for introduction during the current year are many additional advancements and improvements.)

• • •

BECAUSE it concentrates on the building of milling machines exclusively—the Kearney & Trecker organization more than keeps pace with today's needs, and usually anticipates tomorrow's demands in advanced milling machine design and construction.

The soundness of this policy has been demonstrated in the 42 years of the business life of the Kearney & Trecker Corporation — leading to the establishment of the largest plant in the world devoted exclusively to the manufacture of milling machines.



THE NEW 5H PLAIN

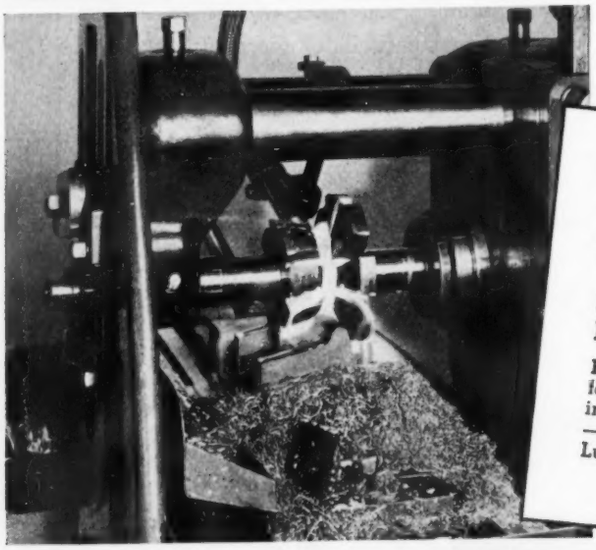
KEARNEY & TRECKER CORPORATION • MILWAUKEE, WISCONSIN, U. S. A.

Step up SPEED...

TURNING... Tools that become soft, chip or burn mean down-time for changes. Machines do not produce at time study rating when shut down for frequent tool resharpenings and resetting.

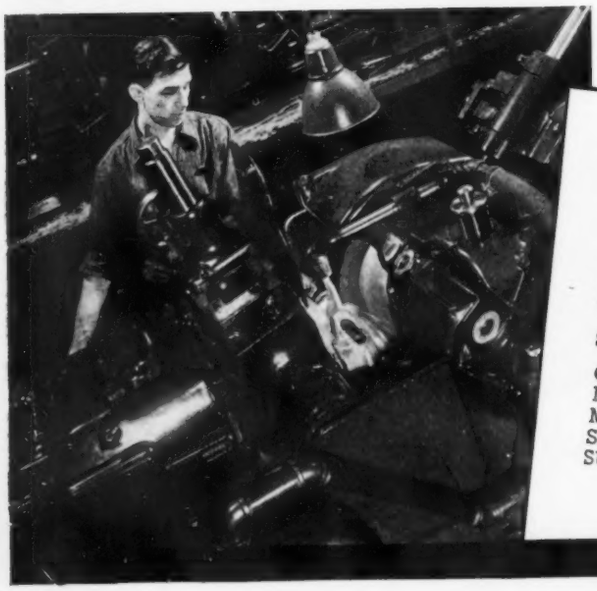
Reduce this drain on machine hours . . . on operators' productive time with SUNOCO.

MONARCH MACHINE TOOL CO. Operation—Semi finish turning steps on spindle Machine—Monarch 20" Model "M" Material—S.A.E 2350 S.F.P.M —250 Depth of cut—¼" Feed—.018" per rev. Cutting Lubricant—1 part SUNOCO to 10 parts water.



MILLING... Cutters must have accurate cutting and clearance angles to perform satisfactorily. With Sunoco they hold their cutting edges longer and mill more pieces per cutter grind . . . this means lower cost per piece machined.

BROWN & SHARPE MFG. CO. . Operation—Milling base lever for surface gauge. Machine—No. 12 Brown & Sharpe Plain Milling Machine. Material—S.A.E. 1020. Cutter-Formed. Cutter speed —60 RPM. Depth of Cut—$\frac{1}{32}$" Table feed—2½" per min. Cutting Lubricant—1 part SUNOCO to 20 parts water.



GRINDING . . . Faster metal removal is possible without increasing wheel wear with SUNOCO. There's rapid dissipation of heat generated . . . and wheels do not load or burn. Close tolerances and mirror finishes will be maintained—even at high peripheral speeds.

CINCINNATI GRINDERS INCORPORATED . . . . Operation—Finish grind 1.8276 diameter. Machine—No. 2 Centerless Grinder. Material—Steel Forging. Stock Removal—.0002" to .0005". Limits Size—.0001 straight .0000 roundness .0005. Coolant—1 part SUNOCO to 40 parts water.

ACCURACY...*and* QUALITY !

SUNOCO

EMULSIFYING

CUTTING OIL . . . PREFERRED FOR ITS PERFORMANCE ALONE!

SPEED of production . . . ACCURACY of cut . . . QUALITY of finish . . . all are possible thanks to the outstanding high lubricating and cooling qualities of SUNOCO Emulsifying Cutting Oil.

Higher speeds . . . heavier feeds . . . and more exacting "precision" requirements are today's "demands" . . . the result of a tremendous advancement in modern machine tool design. And you'll find SUNOCO is the true ally of the "Master Tools of Industry"; advancing hand-in-hand with the Metal Working Industry's march forward!

KEEP IN STEP WITH PROGRESS . . . profit from the example of machine tool builders themselves, who use and recommend SUNOCO. You owe it to yourself to test SUNOCO in your own shop . . . under your own working conditions . . . and convince yourself of its plus-performance ability.

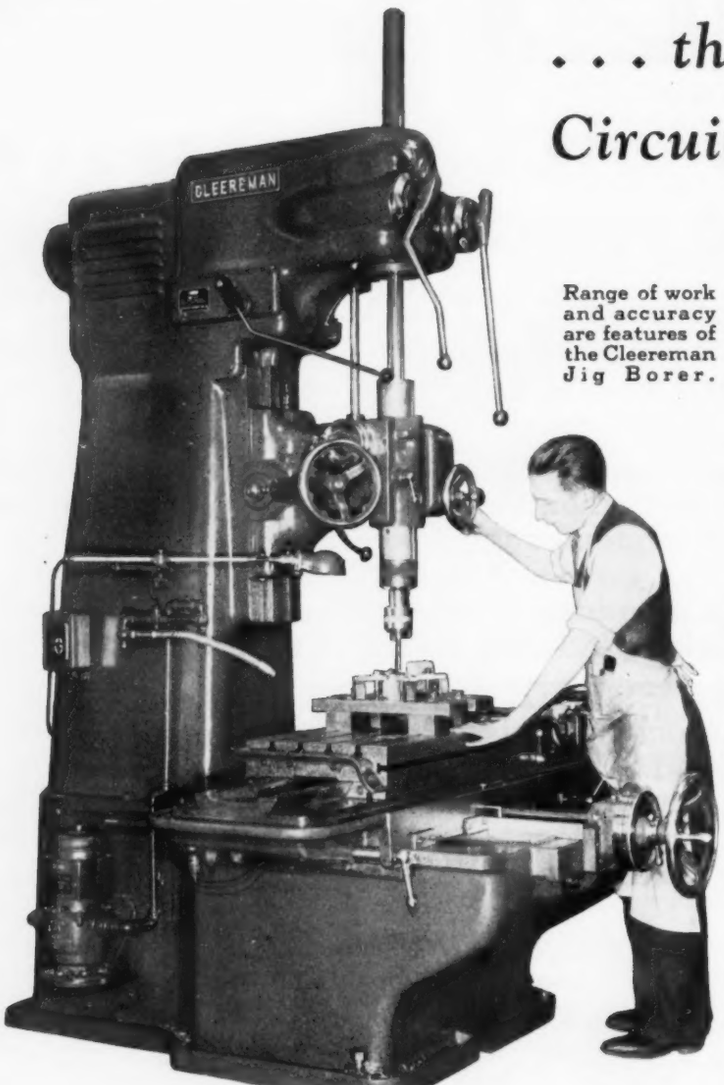
SUN OIL COMPANY, Philadelphia, Pa.

Sponsors of The Sunoco News Voice of the Air—Lowell Thomas

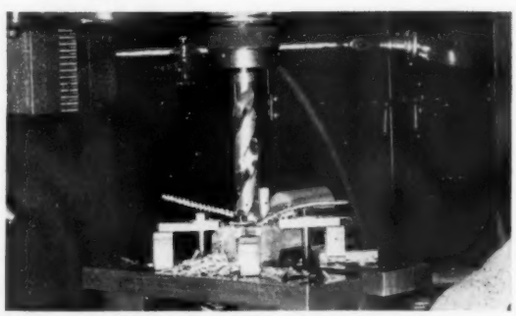
Another Repeat Order

FOR A CLEEREMAN JIG BORER

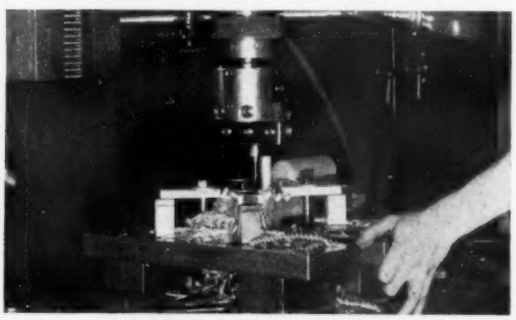
. . . this time from I-T-E Circuit Breaker Company



Range of work and accuracy are features of the Cleereman Jig Borer.



Cleereman Jig Borer drilling large pivot hole in circuit breaker crank arm.



Accurate boring operation on air blast breaker part showing versatility of the Cleereman Jig Borer.

★ WRITE FOR CATALOG NO. 200

Address
Bryant Machinery & Engineering Company
400 W. Madison St., Chicago, Ill., U. S. A.
Sales Division of
Cleereman Machine Tool Company
Green Bay, Wis.

CLEEREMAN

DRILLING MACHINES and JIG BORERS

So PREMIER WAS CHOSEN FOR ALL OPERATIONS!

LENGTHENED TOOL LIFE 25%

● A 25% increase in tool life really means something when it is applied to the big volume turned out by one of the Middle West's largest machine shops. Yet that large saving really was achieved when Premier Cutting Oil went on the job.

And this saving is not guesswork. An accurate time record was kept on tool life with other oils and with Premier—and then an interesting thing was done. Premier was standardized on for *all* operations! It was found more economical to have one oil for all operations than to handle two or three for specific uses. Premier proved to be the most economical oil for this all-around purpose.

Your own cutting oil problems may offer real chances for saving—lengthened tool life, increased production, better finish. Let a Standard Oil Engineer discuss your problems with you. Reach him at your local Standard Oil (Indiana) office, or by writing 910 S. Michigan Avenue, Chicago, Illinois.

Copr. 1940, Standard Oil Co. (Ind.)

PREMIER CUTTING OIL

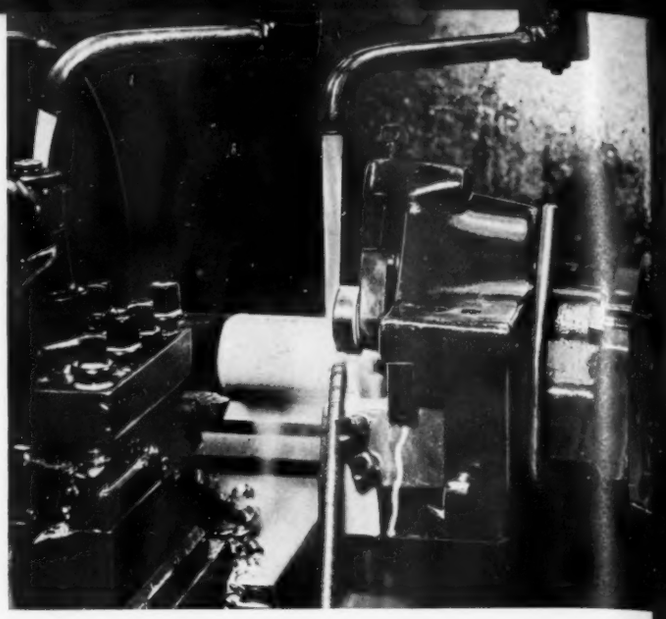
STANDARD OIL COMPANY (INDIANA)

..LUBRICATION ENGINEERING..LUBRICATION ENGINEERING..LUBRICATION ENGINEERING..LUBRICATIO

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICA

A COOL 25% IMPROVEMENT!

SUPERLA SOLUBLE OIL



An economy-minded St. Louis manufacturer has experimented with many soluble oils during the past ten years—trying to find one that would be more economical than Superla! He hasn't. He still uses Superla—on milling, drilling, grinding, and other operations.

He says he gets 25% to 30% better tool life with Superla and his operators remark about its effective *cooling* quality. Perhaps Superla is the answer for *you!*

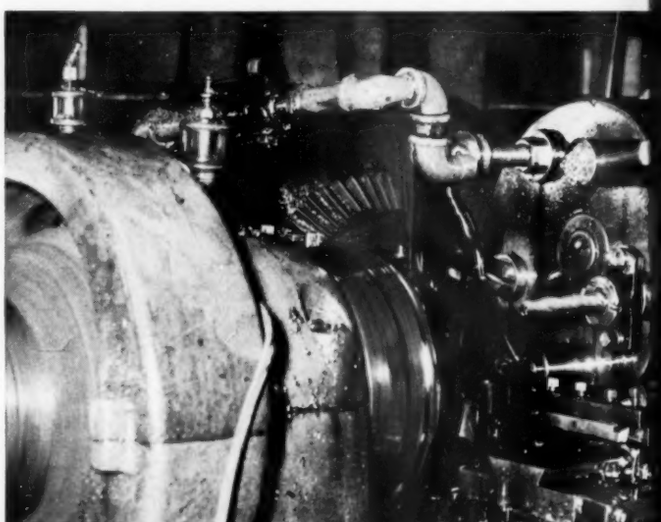
STANDARD PASTE COMPOUND

GIVES 2000 MORE PIECES BETWEEN REGRINDS!

—And that was a 200% increase! A Michigan auto parts manufacturer enjoyed this jump in broach life when he changed to Standard Paste Compound at the suggestion of his Standard Oil Engineer. He also found that Standard Paste Compound kept the broach teeth free from chips. And it saved the machine, and operator, time formerly spent cleaning the broach after each cut. Your own Standard Oil Engineer may be able to help *you* with similar cost-saving suggestions.

CONFIDENTIALLY, IT DOESN'T SMELL!

ACME CUTTING OIL



From the *cost* standpoint, the elimination of odor was probably less important than the *lengthened tool life* which an Illinois machine tool company began to enjoy the minute they threw out the animal fat and paraffin oil mixture in favor of Acme Cutting Oil. But it was also found that the operators were unanimously in favor of Acme—when noses were counted. Acme cost less, and saved the time and trouble of mixing, too.

It frequently happens that cutting oil problems can be solved more *quickly* and *economically* in consultation with a Standard Oil Engineer. They're glad to study your problems with you, and their advice is unbiased and free.

SEND FOR LUBRICATION INFORMATION

STANDARD OIL COMPANY (Indiana) JUNE
910 S. Michigan Avenue, Chicago, Illinois. Room 1222

Gentlemen: I am in one of your middle western states. Please send me:

☐ "Cutting Oils." ☐ "Soluble Oils."

☐ "The Lubrication Engineer—His Value to You."

☐ Information about: .....

Name ..... *Position* .....

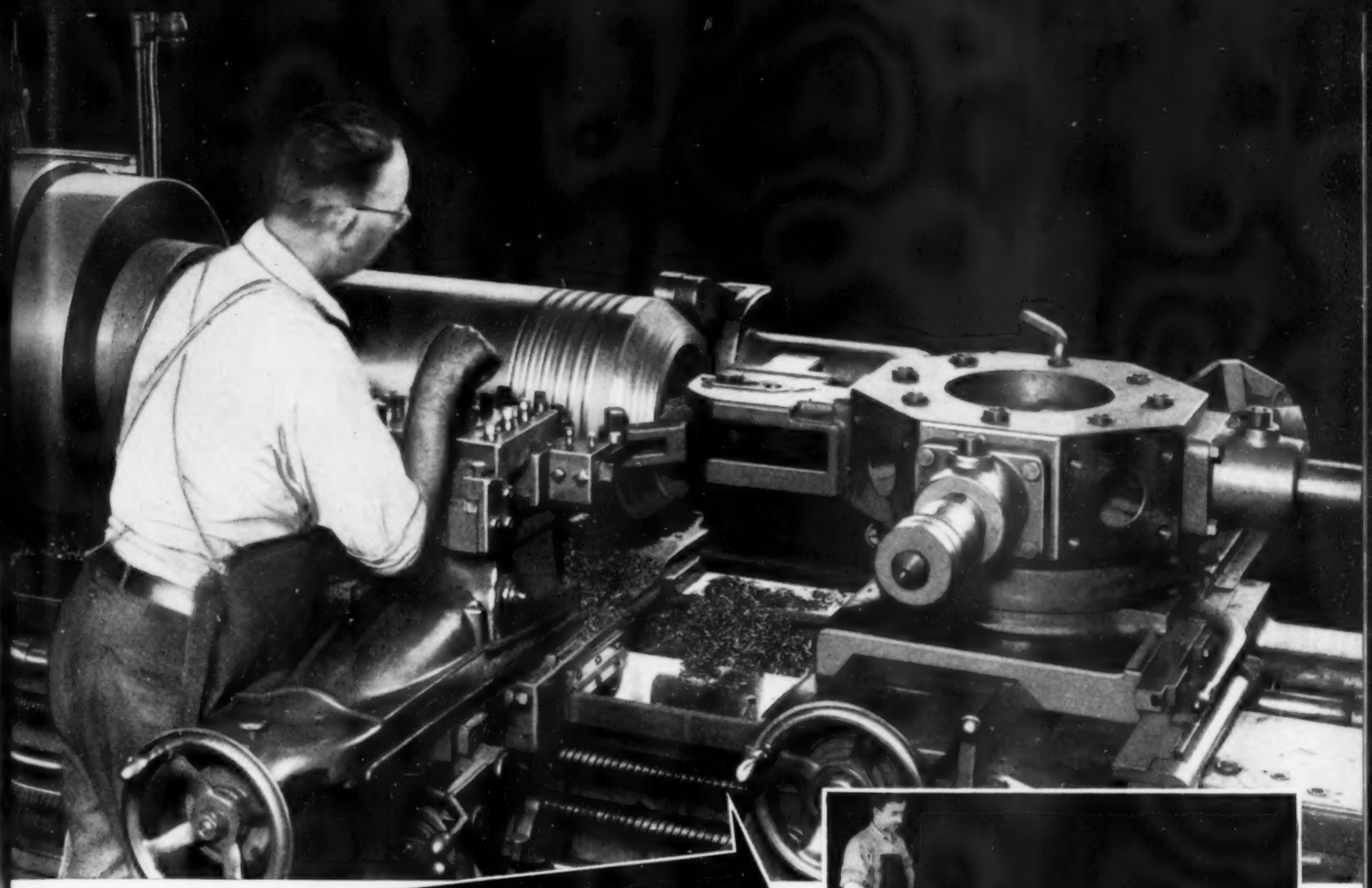
Company .....

Street .....

City ..... *State* .....

● Use the coupon at the left to check the informative booklets you desire, or to write in briefly the nature of any type of lubrication problem that may confront you at this time.

You can reach Standard Oil Engineers direct through your local Standard Oil (Indiana) office, or by writing 910 South Michigan Avenue, Chicago, Illinois.



DIESEL PISTONS

IN ½ THE TIME AT ½ THE COST

● Here's another example of the way these new Gisholts are speeding up production and cutting machining costs in a great many plants. To do this job a Gisholt 4L Heavy-Duty Turret Lathe was selected—and the choice was a wise one. This turret lathe, equipped with a cross feeding turret, taper attachments, and standard as well as special tools, reduced the former machining costs as much as 50%.

The extreme flexibility of these new Gisholts permits handling a wide variety of work with substantial savings in time and money. A Gisholt engineer will be glad to explain how these new economies may be applied to your work.

"YOUR SMARTEST INVESTMENT TODAY—BETTER MACHINE TOOLS"

★ *These pistons, in 13 different sizes, range from 8" to 16" O. D., and from 12" to 37" in length. Even the heaviest of them, weighing 750 lbs., is completely machined in three operations. Uniform thickness of walls is assured by accurately centering pistons on a pot-type, air-operated chuck. Inside diameters on all sizes are bored with single point boring bars. Close tolerances are held with very smooth finish.*

●

Write for your copy of this catalog on Gisholt Heavy-Duty Turret Lathes.

GISHOLT

GISHOLT MACHINE COMPANY

1201 EAST WASHINGTON AVENUE, MADISON, WISCONSIN, U. S. A.

TURRET LATHES · AUTOMATIC LATHES · BALANCING MACHINES

THE RIGHT TEETH FOR THE JOB

Nature knows animal teeth! . . . the kinds of "bite" they've got to have to meet their various owners' needs for existence. . . . Teeth for tearing, cutting, gnawing, crushing, grinding, chewing!

Nicholson knows file teeth! . . . the kinds of "bite" they've got to have to meet industry's needs in working with ***various materials*** toward attaining ***various results*** in ***various products.***

The combinations of factors involved are legion! . . . with materials like irons, steels, brass, aluminum, lead, silver, woods, plastics (and their alloys or derivatives) . . . with parts like forgings, castings, moldings—milled, carved, ground or hammered shapes . . . with operations that call for rough, smooth, lathe, edge or precision filing.

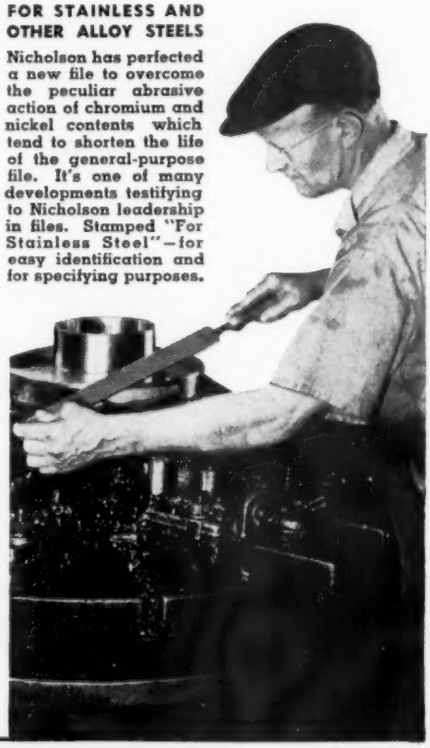
Consider all these, and it is understandable that ***correctness*** in files—shape, size, tooth cut and angle, teeth per inch—is tremendously important toward good workmanship, fast production, and low filing costs.

An industrial science, indeed, is file-making! Nicholson has been at it seventy-six years. Today there are more than three thousand Nicholson and Black Diamond File types, shapes and sizes with "the right bite for the job"—and with uniform top-notch quality that enables Nicholson to guarantee ***"Twelve perfect files in every dozen."***

NICHOLSON FILE CO., Providence, R. I., U. S. A.
CANADIAN PLANT, PORT HOPE, ONT.

FOR STAINLESS AND OTHER ALLOY STEELS

Nicholson has perfected a new file to overcome the peculiar abrasive action of chromium and nickel contents which tend to shorten the life of the general-purpose file. It's one of many developments testifying to Nicholson leadership in files. Stamped "For Stainless Steel"—for easy identification and for specifying purposes.

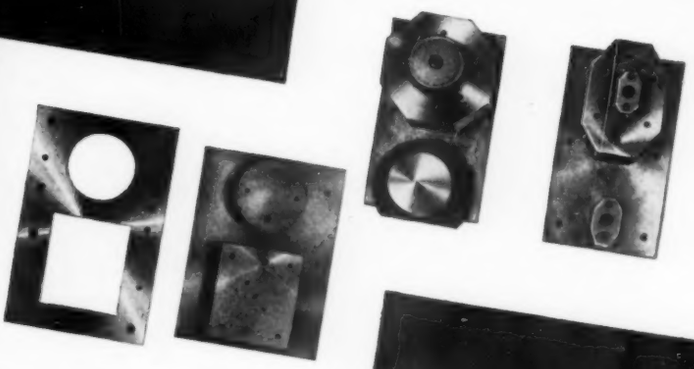


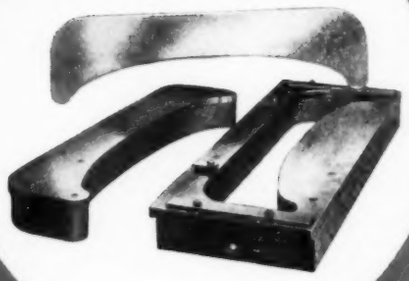
NICHOLSON FILES

NICHOLSON U.S.A. MADE IN U.S.A.

FOR EVERY PURPOSE

"Match your toughest jobs with VASCO Steels and you'll detour trouble before it starts." Good advice—which has licked stubborn problems in scores of industries. The VASCO man knows how!

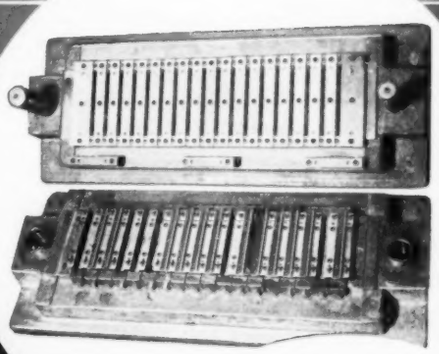




★ **NON-SHRINKABLE** For stamping, blanking, thread-rolling dies—and a multitude of other tools where exact size and shape must be retained. Uniform, strong, durable!

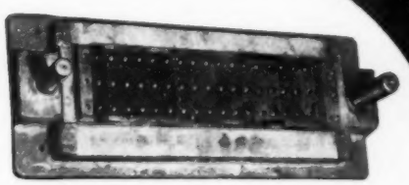
★ **AIR HARD** For intricate dies where a deep-hardening, non-deforming steel is a "must" requirement. Excellent wear resistance—no tendency to crack in hardening!

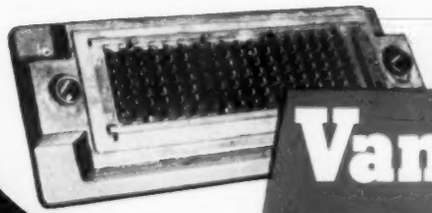
★ **RED STAR TUNGSTEN** For taps, reamers, punches, dies, finished tools, forming tools, gauges, etc. Will take and retain an exceedingly keen cutting edge—resists wear!



★ **CROCAR** For use where high-carbon, high-chromium steel is desired, with the PLUS values of uniformity and ready machinability!

★ **O-Hi-O DIE** For body dies and similar demands, where steel high in carbon and chromium is required, yet must be air-hardened for minimum movement and warpage. Easily machined!



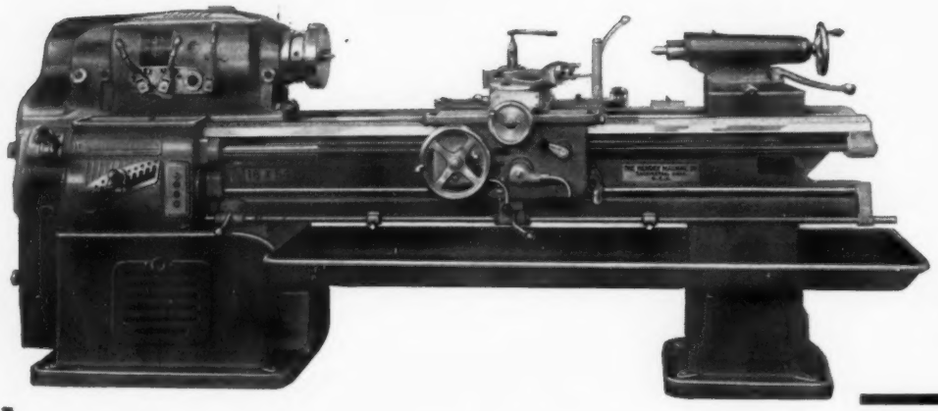


5 TYPES OF VASCO DIE STEELS

EACH WITH ITS OWN DEFINITE CHARACTERISTICS AND EVERY ONE A STANDOUT FOR UNIFORMITY, MACHINABILITY AND MAXIMUM RESISTANCE TO WEAR AND WARPAGE!

Vanadium-Alloys STEEL CO. LATROBE, PA.

"TOPS IN TOOL STEELS"

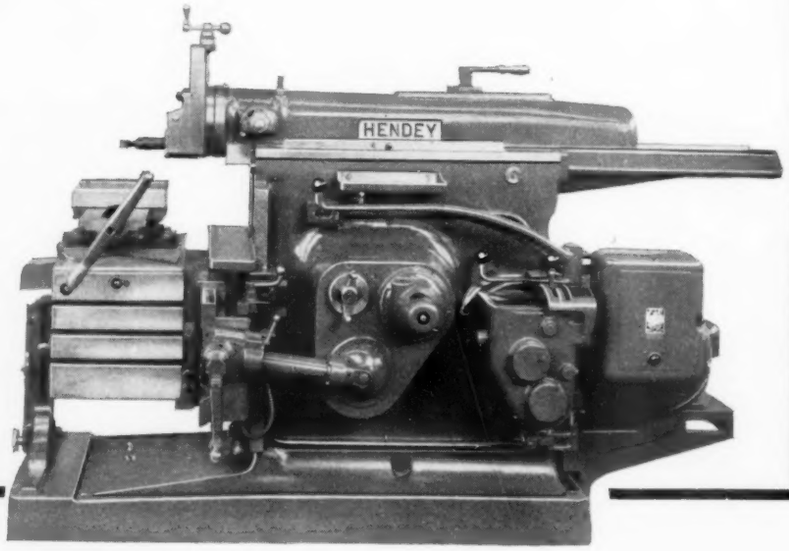


15" to 24" Swing . . . 12 and 18 Spindle Speeds . . Precision anti friction bearings for spindle . . . Precision Lead Screws . . . Cam Lock and Long Taper Spindle Noses.

Mr. Manufacturer:

You who are concerned with concrete facts about obsolescence in your equipment and are minded to increase your plant efficiency, will do well to give thought to buying HENDEY LATHES AND SHAPERS for this purpose. These are PRECISION-PRODUCTION TOOL ROOM MACHINES, and will materially aid you in carrying out your plans. They incorporate an enduring ruggedness with high efficiency, acquired through years upon years of constantly applied intelligent effort and determination to make but the best. HENDEY TOOLS are in every way worthy of your consideration.

12 – 16 – 20 – 24 – 28" Stroke . . . Universal and Plain Tables . . . Power Rapid Traverse . . . Automatic Lubrication.



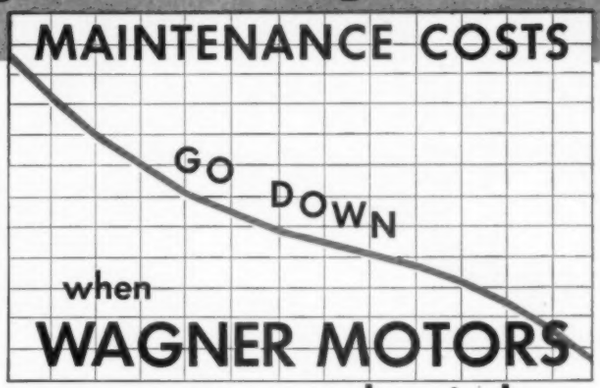
THE HENDEY MACHINE COMPANY

TORRINGTON, CONN.

BOSTON NEW YORK ROCHESTER DETROIT CHICAGO

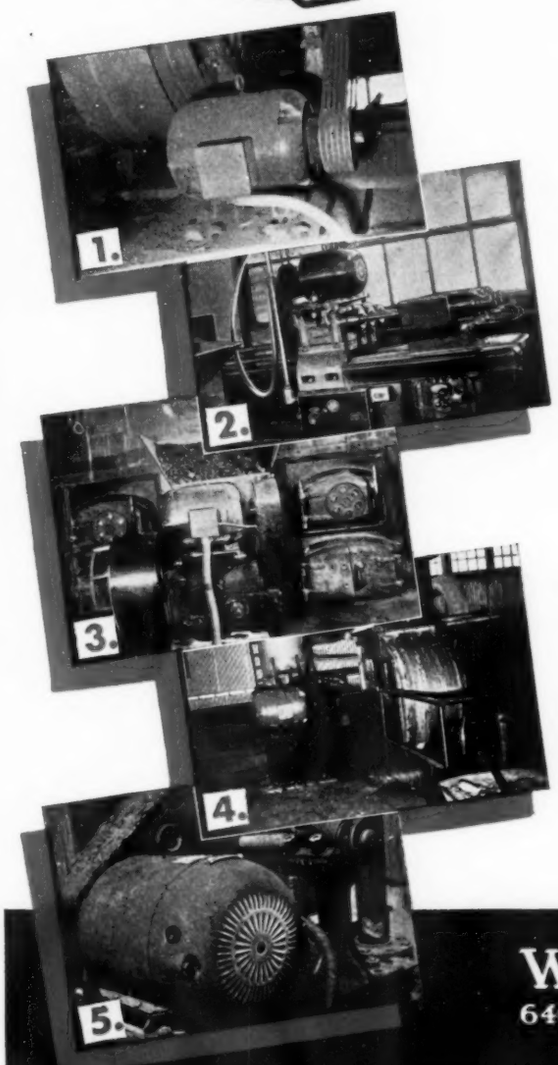
Branches in Principal Cities

WAGNER *CP* MOTORS
will save you money!



are put on the job –

They solve problems such as the following:



1. **ABRASIVE DUST**— Any kind of dust of sufficient density to act as an abrasive, such as iron, glass, sand, rock, coal or coke, causes wear on moving parts and windings, thereby shortening the life of the motor. The Wagner CP motor shown at the left is installed in a foundry where the atmosphere is heavily laden with iron dust, but no amount of dust in the atmosphere can harm the bearings or windings of this CP motor, since it is completely self-protected against the entrance of all such destructive agents.

2. **CONDUCTIVE DUST**— Current-carrying substances such as the dust of certain metals and their salts (present in the atmosphere of steel mills, metal-working plants, and machine shops) collect on the windings of ordinary motors, causing short-circuits and grounds. Motor failure in a location such as shown at the left means not only the expense of repairing or replacing the motor, but also the loss of valuable production time. Wagner CP motors are not affected by metal dust since the dust cannot reach the windings of the motor.

3. **EXPLOSIVE DUST**— Coal dust when present in the proper proportion creates an explosive atmosphere. As a safeguard againt explosion, the 1600-lb.-per-hour stoker shown at the left (said to be the largest single-retort underfeed type stoker ever installed) is operated by a Wagner type CP totally-enclosed fan-cooled motor. Explosive dusts are also present in grain elevators, flour and feed mills, planing mills, and pulverized coal plants. Dust cannot enter Wagner CP motors—the windings and bearings are completely protected by the air-tight inner frame.

4. **CORROSIVE GASES OR FUMES**—The Wagner CP motor shown at the left solved a tough problem for the large chemical plant where it is driving a mechanical agitator—the problem of finding a motor that would give satisfactory service despite the presence of acid fumes. The atmospheric conditions of this installation are duplicated in gas plants, paint shops, dye houses, and dipping and plating departments of all kinds. Wagner CP totally-enclosed fan-cooled motors are particularly suited for these jobs.

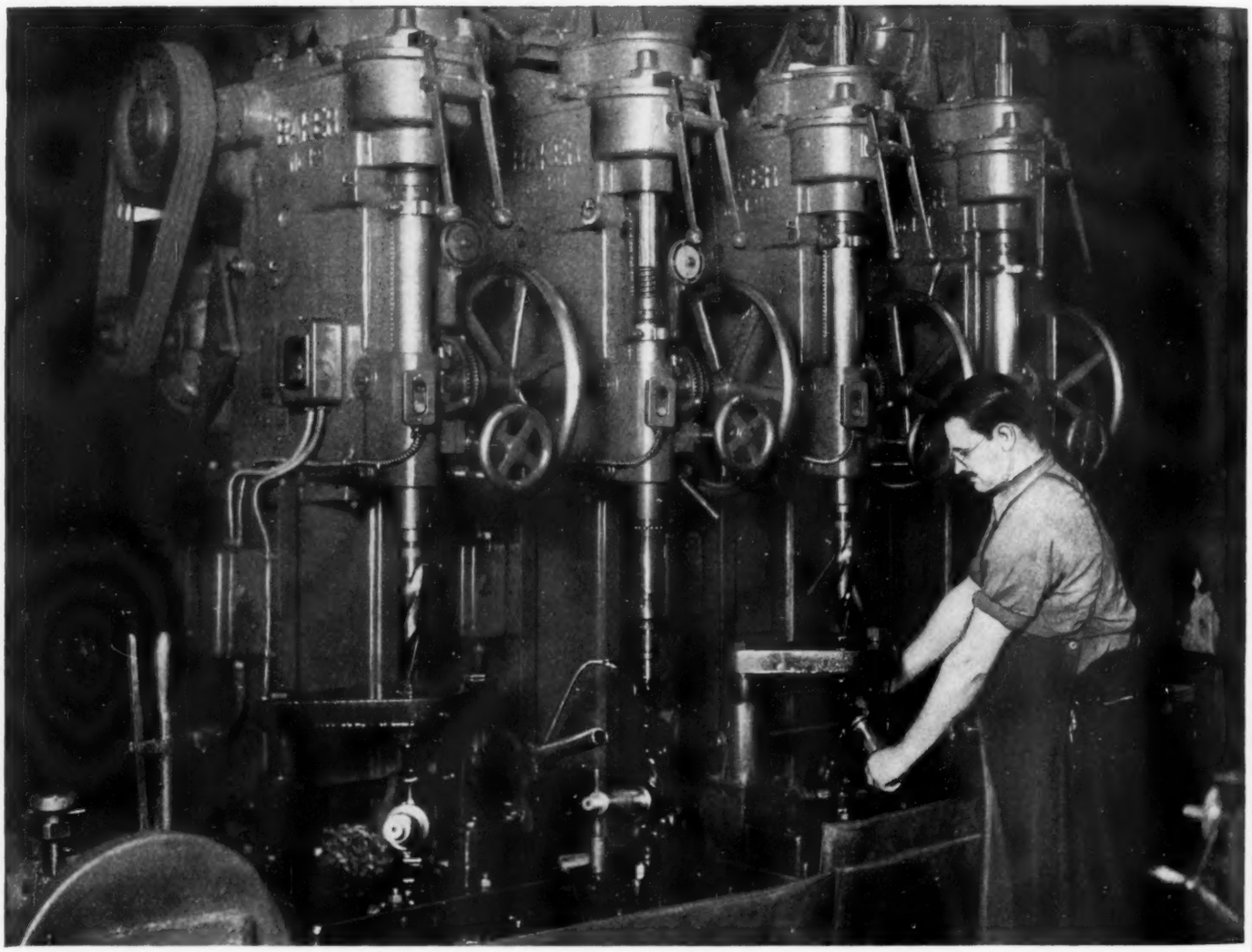
5. **STEAM AND MOISTURE**— Wagner CP motors overcome the steam and moisture problem prevalent in laundries, meat packing plants, paper and pulp industries, glass factories, steel mills, coal tipples and any outdoor service. The CP motor shown at the left is installed outdoors, exposed to elements of the weather the year around. Steam and moisture would short-circuit or corrode the ordinary motor, but not this Wagner type CP motor, as it is completely self-protected against the entrance of fumes or moisture.

M40-11

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

MOTORS · TRANSFORMERS · FANS · BRAKES

DRILL LIFE



4-SPINDLE BAKER DRILL PRESS set up for drilling the steering knuckles shown on opposite page. Changing to *Texaco Sultex Cutting Oil,* output per drill-grind increased from 15 to 70 pieces.

THE STEERING KNUCKLES on opposite page are forgings of SAE 4130 steel, heat treated 241, Brinelling 285. 366% increase in output resulted from changing to *Texaco Sultex Cutting Oil B.*

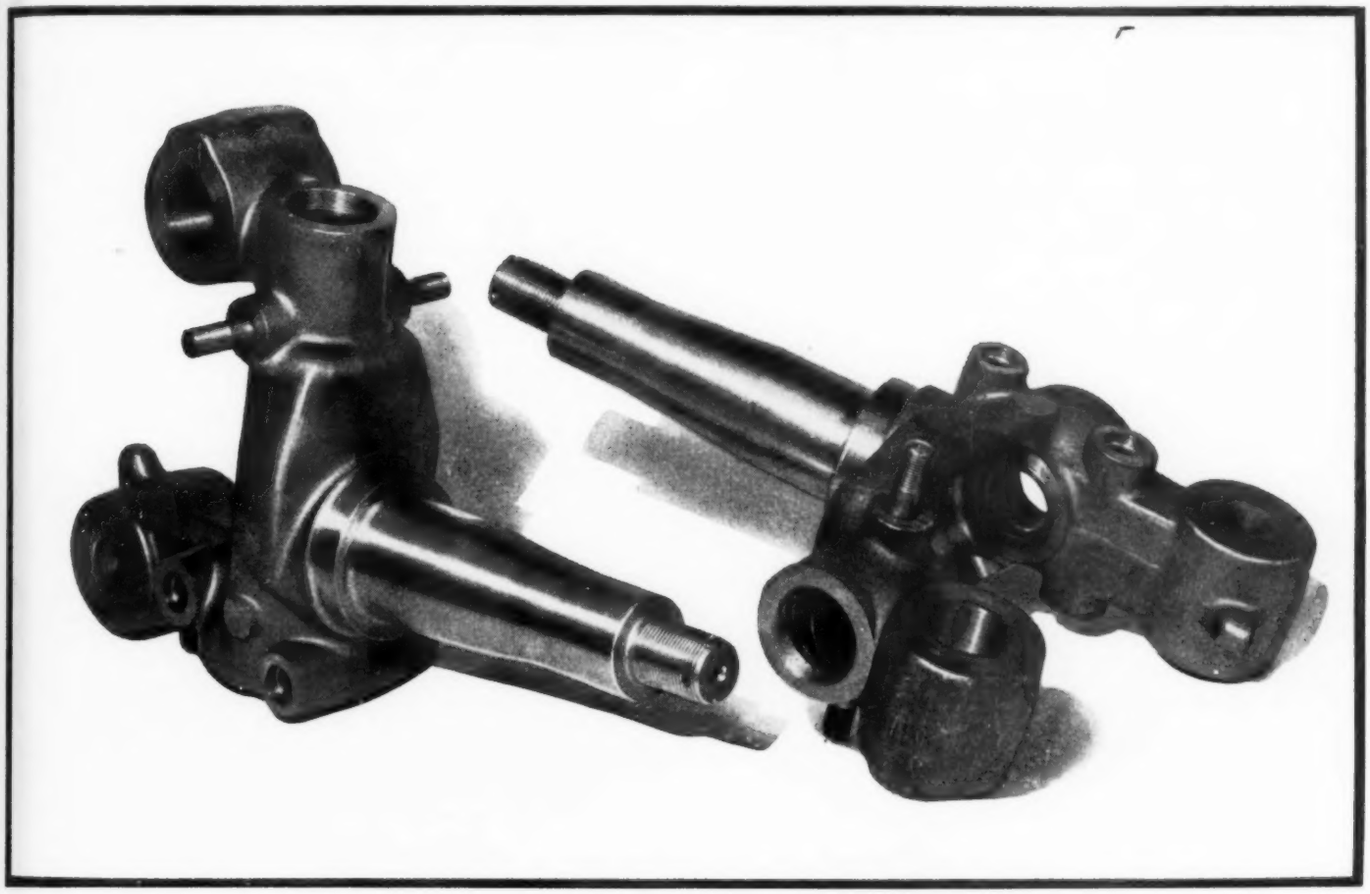
Texaco Dealers invite you to tune in The Texaco Star Theatre —a full hour of all-star entertainment — Every Wednesday Night — Columbia Network—9:00 E.D.T., 8:00 E.S.T., 8:00 C.D.T., 7:00 C.S.T., 6:00 M.S.T., 5:00 P.S.T.

TEXACO

TEXACO

REG. T. M.

INCREASED From *15 TO 70 PIECES!*



MACHINING these steering knuckles in 4-spindle Baker Drill Presses, the best production between drill-grinds was 15 pieces.

Then . . . by the simple change-over, from one brand of cutting oil to another . . . the output per drill-grind quickly went up to 70.

The cutting oil that brought this 366% increase is *TEXACO SULTEX CUTTING OIL B.*

Trained engineers specializing in cutting oils will gladly demonstrate *Texaco Sultex Cutting* and *Soluble Oils* in your plant. Phone the nearest of more than 2300 warehousing points, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

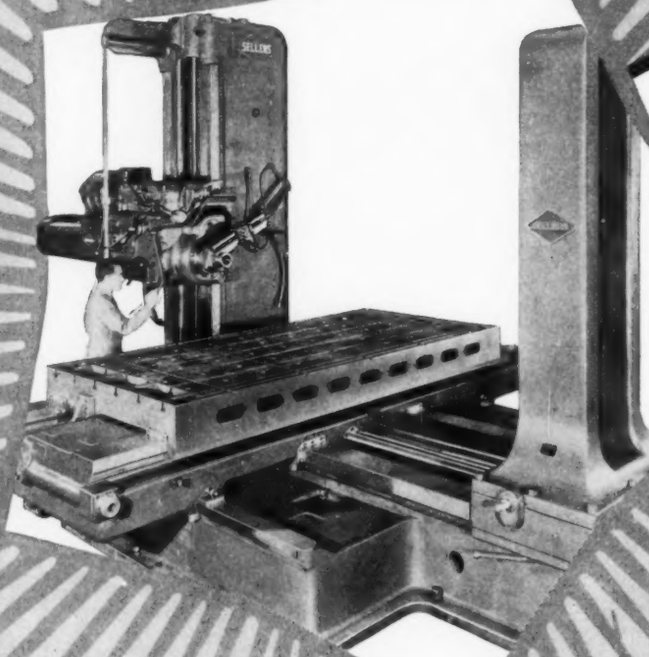
SULTEX CUTTING AND SOLUBLE OILS

FOUR S

★ ★

...EVERY ONE A "FOUR ST

1



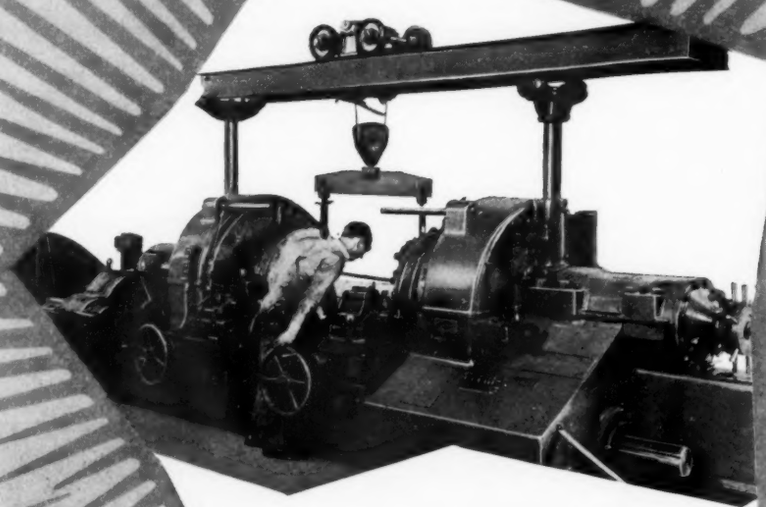
1 SELLERS HORIZONTAL BORING, DRILLING & MILLING MACHINE

A sturdy, dependable helper in many industries. Photo shows machine installed in one of the largest steel mills in the West.

2 SELLERS CAR WHEEL LATHE

Keeps the country's fast, crack trains running on schedule, by turning accurate, smooth, round wheels.

2

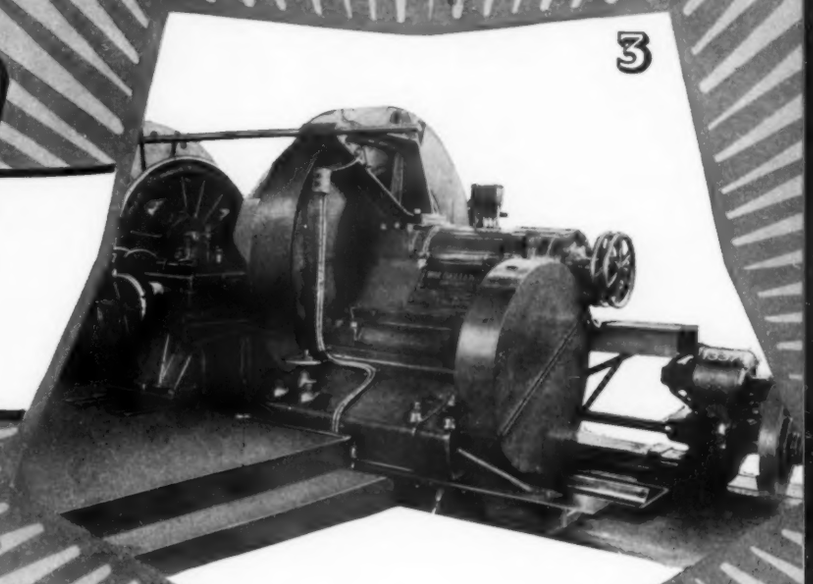


WILLIAM SELLERS & CO., Incorporated · PHILADELPHIA, PA.

STARS

★ ★ ★

STAR" PERFORMER



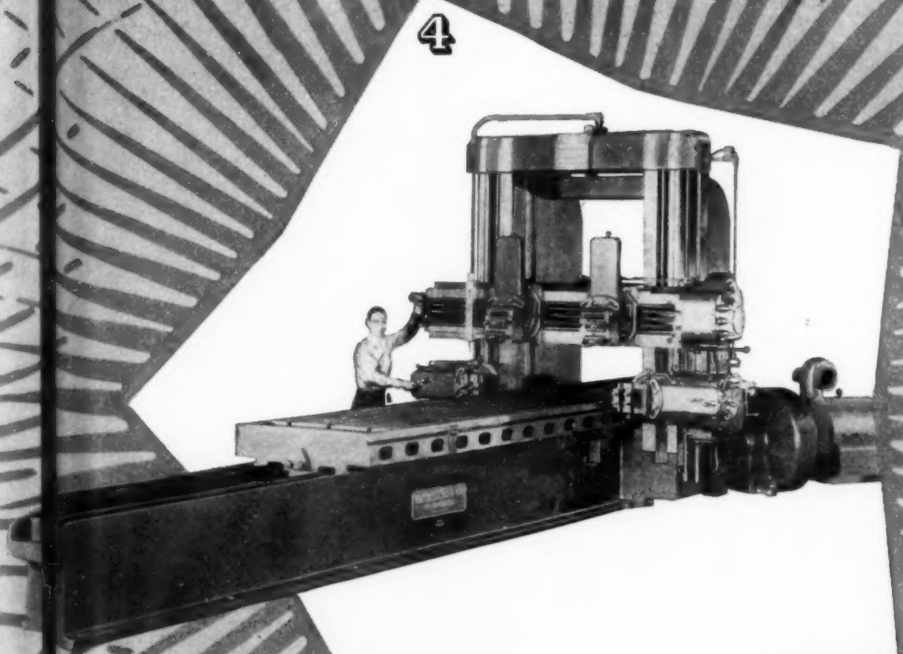
3 SELLERS DRIVING WHEEL LATHE

Turning the driving wheels of the fastest locomotives—

Broadway Limited, Hiawatha, 20th Century, Pan American, Black Diamond, Crusader, Merchants.

4 SELLERS "POWER FLOW" PLANER

This machine tool helps build the U. S. Navy . . . by fast, accurate planing of battleship parts.



FOUNDED SELLERS 1848

Sellers

Three Ways the CR7008 SAVES

1. Simplifies Ordering

Simply specify the motor rating and indicate the type of disconnect desired—we'll send just the control you need.

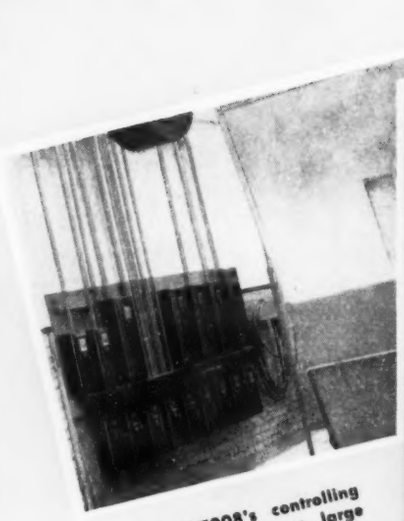
2. Facilitates Mounting

When you receive it, it's all wrapped up in a package, ready to deliver to the job, put in place and wire in.

3. Simplifies Wiring

By attaching power and motor leads to well-marked terminals, and connecting to pushbutton, starter is prepared for operation—any man on your crew can do the job.

COSTS GO DOWN



Bank of CR7008's controlling Garnett machine in a large automobile upholstery plant.

Dust-tight CR7008's and other G-E controls in a Minneapolis grain elevator.

Motor Starter by

SAFETY GOES UP

EVERY TIME YOU INSTALL A G-E COMBINATION STARTER

Mr. Motor User:

WE think you will want to know about a "short-cut" to savings — one that dozens of customers have told us about enthusiastically. They have found that by using our CR7008 combination starters* they effect material savings on the installed cost of control for their motors.

They are also continuing to *specify* these starters because of the extra safety features. Greater protection is provided for operators and equipment. And why shouldn't they have this protection,— the starter that provides it, costs less installed.

HOW YOU CAN LEARN ABOUT THESE SAVINGS YOURSELF

Don't take our word for the economy of using this starter—and for its many other features. Next time you install control for a motor, use a single unit instead of several—make it a G-E combination starter. Keep an accurate record of the cost of the starter *plus* the cost of the installation. Compare that with the cost of buying separate devices, mounting, and wiring them. We'll wager that the CR7008 will prove less expensive. You'll realize a saving, and at the same time get a control that will give you the advantage of *extra safety*. General Electric, Schenectady, N. Y.

*The G-E combination starter consists of a manual disconnect with or without fuses (or a manual circuit breaker) plus a magnetic starter for operation by push-button stations.

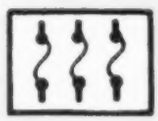
EXTRA Safety for Operators

Cover of enclosure cannot be opened unless manual switch is open and power removed from all but incoming terminals.

Manual switch cannot be closed to apply power as long as cover remains open.

Also You Get

SHORT-CIRCUIT PROTECTION
Fuses or manual air circuit breakers protect against danger due to short circuits.



UNDERVOLTAGE PROTECTION
Prevents automatic restarting after motor shuts down in case of power failure — protects operators.

OVERLOAD PROTECTION
Accurate overload relay protects motor windings against injury due to overheating.

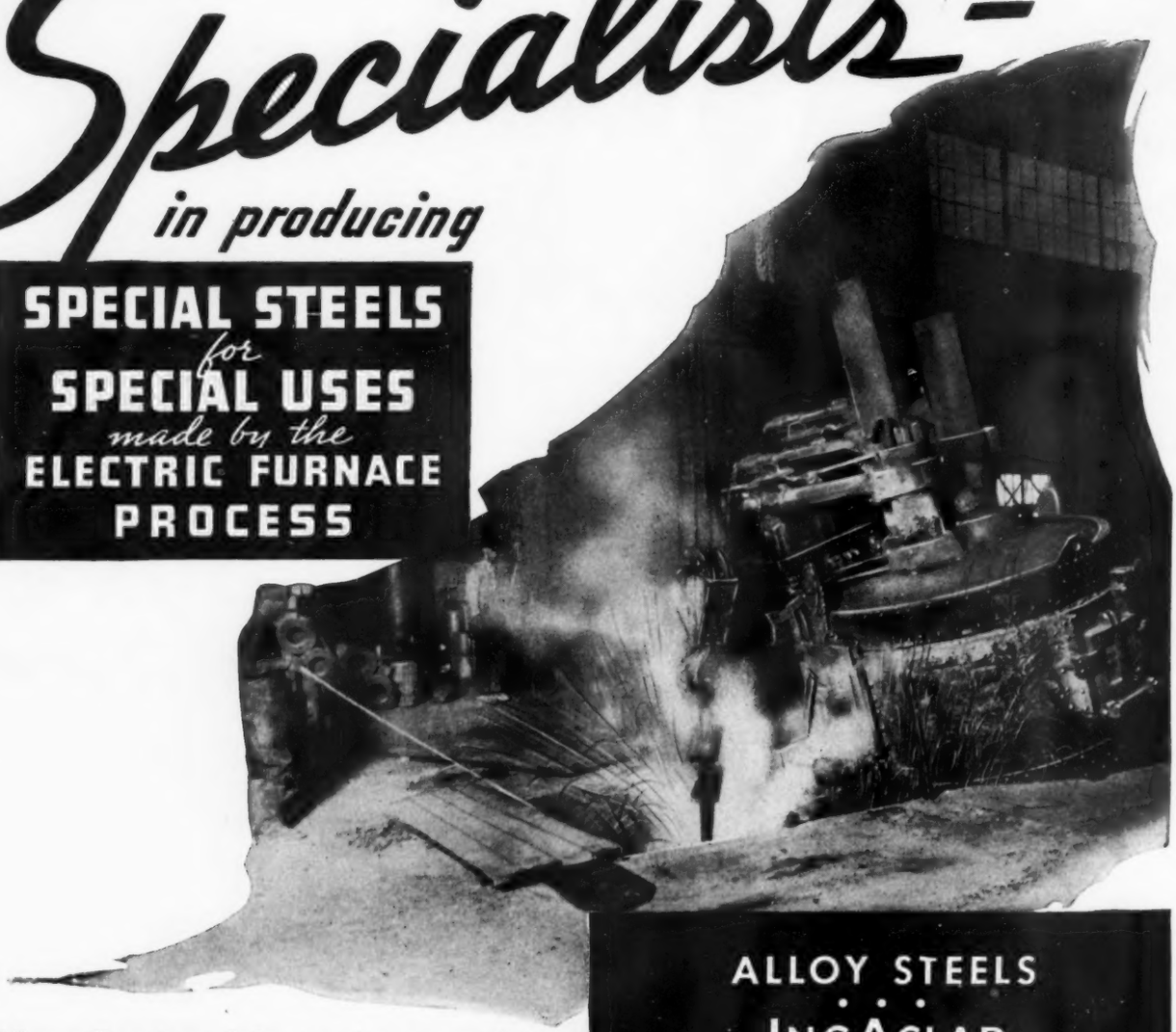
GENERAL ELECTRIC

676-8

"Specialists"—

in producing

SPECIAL STEELS
for
SPECIAL USES
made by the
ELECTRIC FURNACE PROCESS



LET Ingersoll engineers help you solve your needs for "special steels for special uses." For many years the Ingersoll Steel & Disc Division of Borg-Warner Corporation has enjoyed nation-wide recognition as "specialists" in the production of steels made by the Electric Furnace Process, in sheets and plates, to meet unusual service conditions.

Some of the many special steels we supply are listed in the panel to the right.

Write us about your requirements today, and . . .

Inquire especially about Ingersoll

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INGERSOLL PROCESS STEEL

—a special Ingersoll development that gives steel greater resistance to curling and splitting and wear than ever before possible. Address

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ALLOY STEELS
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STAINLESS-CLAD STEEL
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HIGH SPEED STEEL
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KNIFE STEELS
• • •
SAW STEELS
• • •
CLUTCH PLATE STEELS
• • •
TILLAGE STEELS
• • •
SHOVEL STEELS
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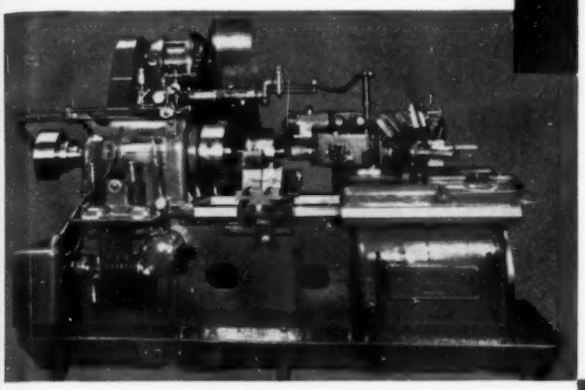
ARMOR PLATE, ETC.

OBSOLETE EQUIPMENT CAN NEVER APPROACH THE PROFIT-MAKING CAPACITY of P & J AUTOMATIC CHUCKING and TURNING MACHINES



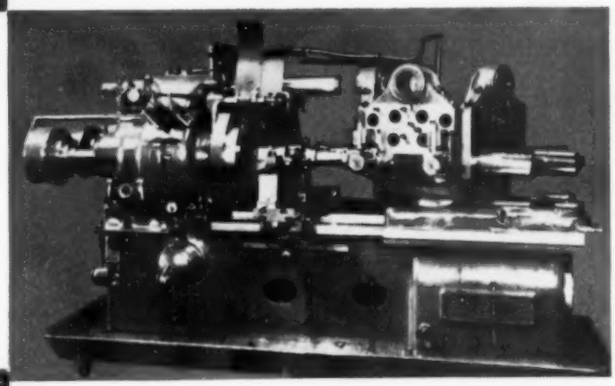
"Modern" is the one word that best describes the many features pioneered and developed by Potter & Johnston which make the use of obsolete equipment for high production an unjustifiable liability.

P&J Automatic Chucking and Turning Machines can be depended on to pay for themselves quickly through increased output, closer accuracy and lower piece cost in the production of duplicate parts. Because of high net returns on the investment P&J Automatics are included in the modernization programs of leaders in the metal working industries.

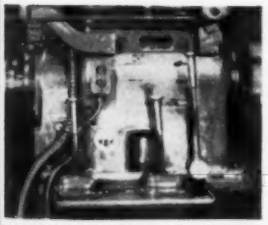
The futility of trying to meet price competition with the use of obsolete equipment is immediately apparent when you compare the cost of handling the same work on modern P & J machines. Ask us to prove it.

P&J 5D POWERFLEX

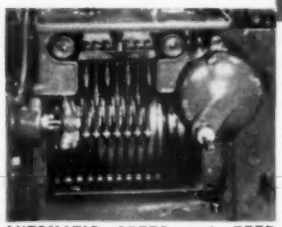
A machine of great flexibility and maximum output per spindle for low cost production of duplicate parts. Four automatic spindle speed changes available while under cut. Full specifications available in Bulletin No. 108.



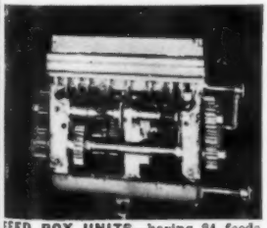
Features of design contributing to modern, low cost performance . . .



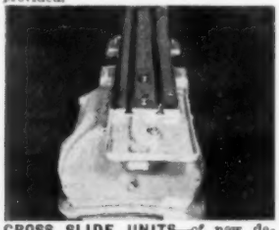
HEADSTOCK UNITS—with spindle of high carbon steel mounted on Anti-Friction Bearings—gears of chrome nickel steel, spiral form tooth.



AUTOMATIC SPEED and FEED CHANGES—providing all changes of speed during regular production runs. An automatic spindle stop is also provided.



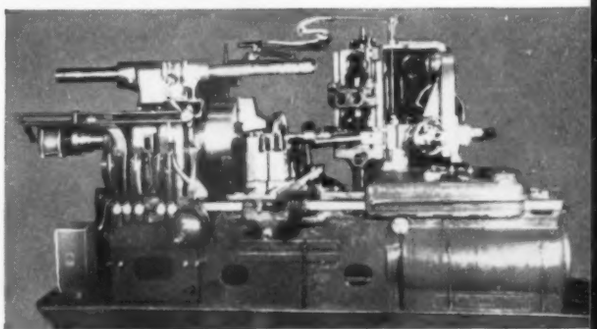
FEED BOX UNITS—having 24 feeds arranged in geometric progression. All gearing is of Alloy Steel and runs in oil.



CROSS SLIDE UNITS—of new design with cam drum located directly under cross slide and readily accessible for application of special cams.

P&J 5D 2-9", 2-12", E2-15" POWERFLEX

A two-spindle machine for production requirements greater than those covered by single spindle units. Four automatic changes of spindle speed while under cut, three automatic feed changes and automatic binding of turret following index. Ask for Bulletin No. 111 giving complete details.



P&J 6D RE and REL AUTOMATICS

Potter & Johnston's more than forty years experience is behind these machines which have proved their ability to produce high quality duplicate parts under maximum production demands at lower cost. Unit construction throughout. Detailed specifications available in Bulletin No. 110.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R.I., U.S.A.

Automatic Machine Tools

FACTORY REPRESENTATIVES: William L. Martin, Headquarters at Factory: New England States and Eastern New York and New Jersey; A. W. Stone, 986 Kenyon Ave., Plainfield, N. J.: Western New York and New Jersey, Eastern Pennsylvania, Maryland and Delaware; G. Tell DuBois, 8-154 General Motors Building, Detroit, Michigan: Michigan and the City of Toledo, Ohio; Louis K. Voelk, 3865 Woodridge Road, Cleveland, Ohio: Ohio — with the exception of Toledo, and Western Pennsylvania: Harry I. Schuster, 743 N. Fourth St., Milwaukee, Wisconsin: Illinois, Missouri, Wisconsin, Iowa and Indiana. AGENCIES: Star Machinery Company, 1741 First St., South, Seattle, Washington; Henes-Morgan Machinery Co., 2026 Santa Fe Ave., Los Angeles, Calif.; Jenison Machinery Co., 20th and Tennessee Sts., San Francisco; Wessendorff, Nelms & Co., Inc., 320 Franklin Ave., Houston, Texas; Arthur Jackson Machine Tool Co., 60 Front St., West, Toronto 2, Ontario; Arthur Jackson Machine Tool Co., 437 Grosvenor Ave., Montreal, Canada; Burton Griffiths & Co., Ltd., Birmingham, England; P. S. Stakvis et Fils, Paris, France; Rotterdam, Holland and Brussels, Belgium; Maskinaktiebolaget Karleby, Stockholm 1, Sweden; Ing. Ercole Voghi, Milano, Italy; Yamatake & Co., Ltd., Tokyo, Japan; Imperial Export Co., 44 Whitehall St., New York, N. Y.; Almacoa, Zurich, Switzerland.

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1st Choice of U.S.A. Industry

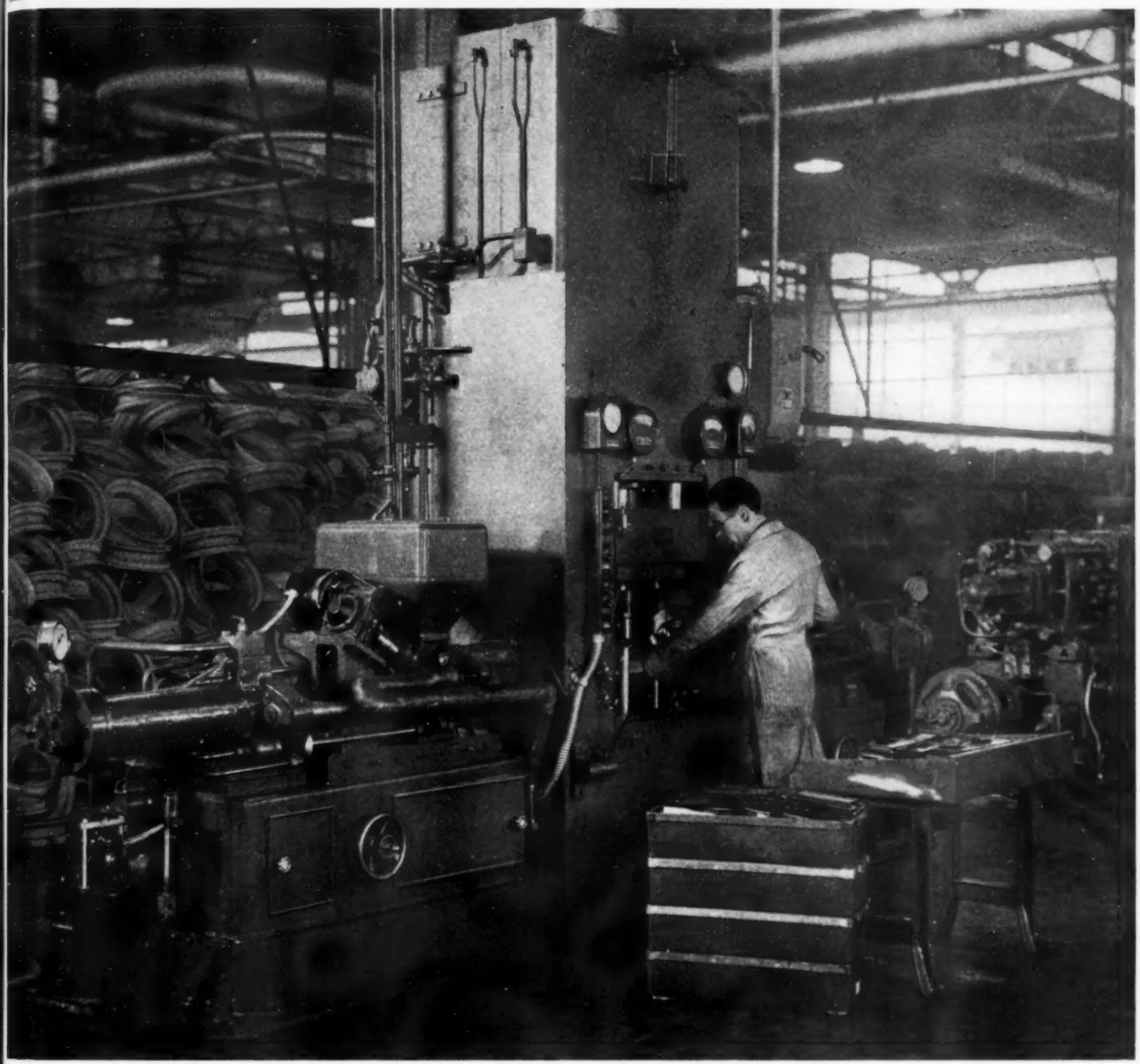
In America, Gargoyle D.T.E. Oils are recognized as the standard of quality for hydraulic oils. Experience proves these oils are right for the job. Their use minimizes the formation of deposits. They flow freely through hydraulic systems—and give instant valve action. You get long, economical oil life, too.

CALL IN Socony-Vacuum for

You'll Profit from these "Exclusives"

☞ **SKILLED LUBRICATION COUNSEL** of a Socony-Vacuum man backed by 74 years' experience... the greatest in the Petroleum Industry.

☞ **A COMPLETE LINE** of Lubricants ... the scientifically correct lubricant for every type of machine you now own ... or will buy.



Correct Lubrication

NEW LUBRICANTS ahead of new needs . . . developed in close cooperation with machine builders by famous Socony-Vacuum laboratories.

HALF A MILLION CASE HISTORIES to guide our engineers in recommending the right use of these lubricants to earn Lubrication Profits for you.

DISTRIBUTION throughout the world. The same high-quality lubricants available everywhere.

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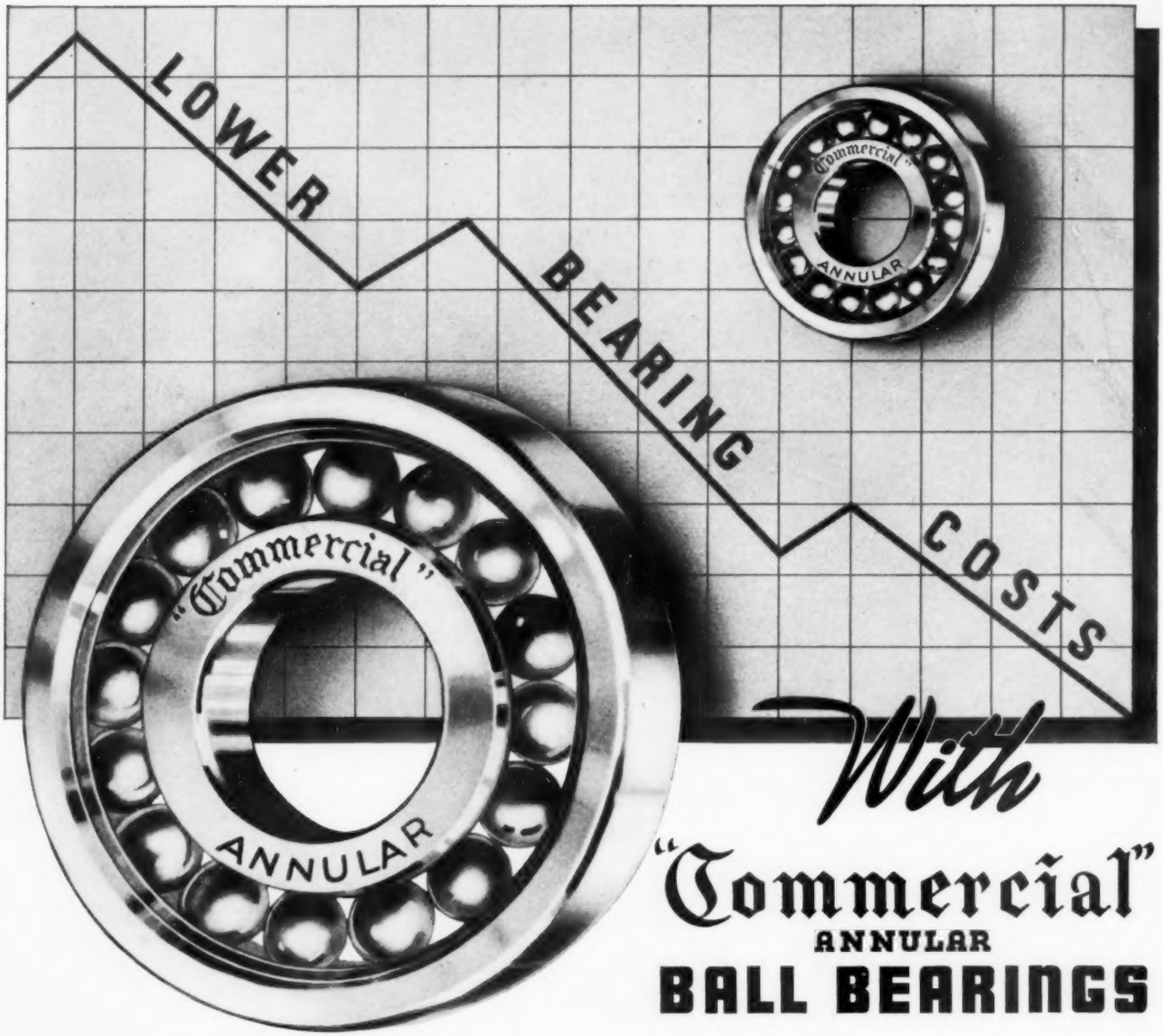
GARGOYLE
Lubricants



With

"Commercial" ANNULAR BALL BEARINGS

MANUFACTURERS in every industry have proved to their own satisfaction, that **"Commercial"** Annular Ball Bearings offer substantial economies,— precision performance at low cost. These bearings may be obtained in standard sizes, or made to your own B.P. specifications. Self-contained. Speeds up to 2500 R.P.M. Dual thrust capacity. Withstand overloads and side-thrusts,— added factors which assure long life and continuous service. Write for complete information and latest catalog.

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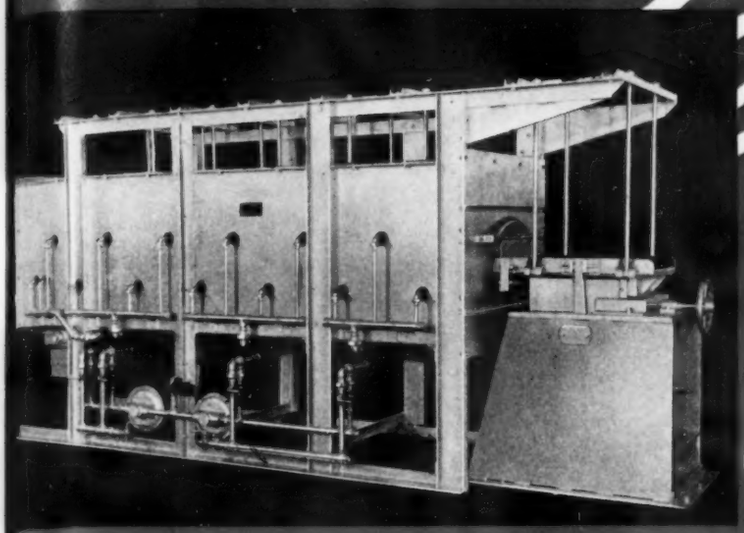
For a better heat treating future



No. 191 "American Reciprocating Full Muffle Continuous Clean Hardening Machine. It will handle practically any work ranging from small, light springs, stampings, drop forgings, etc. up to quite large and heavy pieces. Work *only* enters and leaves the heating chamber.

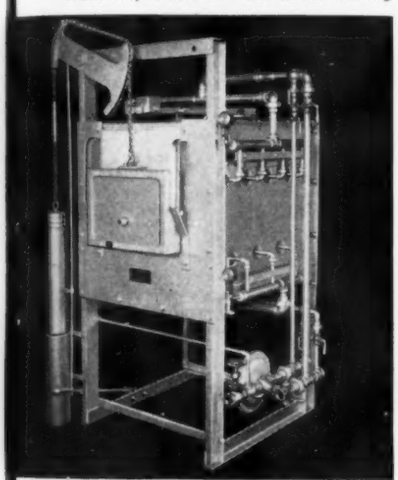
The speed with which heat-treating technique moves forward and the improvements that have attended this progress make it costly to continue to use out-dated equipment.

"American" engineers have pioneered for over sixty years in the development of industrial heating appliances and have constantly modernized designs to improve performance and reduce production and maintenance expenditures. The two clean hardening machines here illustrated, from which all internal driving mechanisms have been eliminated, are striking examples.

Other modern equipment shown here is typical of the line of improved "American" equipment which can be depended on for a better heat treating future. Why not investigate its possibilities?

●

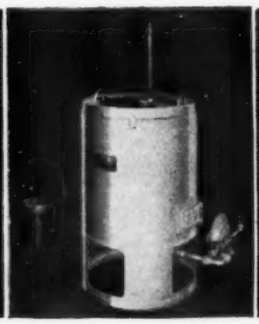
No. 139 "AMERICAN" Continuous Rotary Retort Heating Machine for heat treating work up to 7½ in. maximum dimension. Capacity from 600 to 900 lbs. of work per hour.—Work *only* enters and leaves the heating chamber.



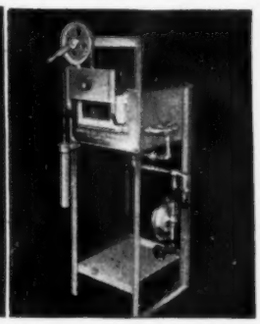
A 200 Series Oven—Featuring over and under firing combined with bottom venting which eliminates furnace drafts and insures efficiency.—May be supplied with automatic vent closures and vestibule burners.

A 300 Series Pot Furnace—Featuring tangential firing combined with down draft venting, thereby insuring longer pot life and better efficiency. Available in nine sizes.

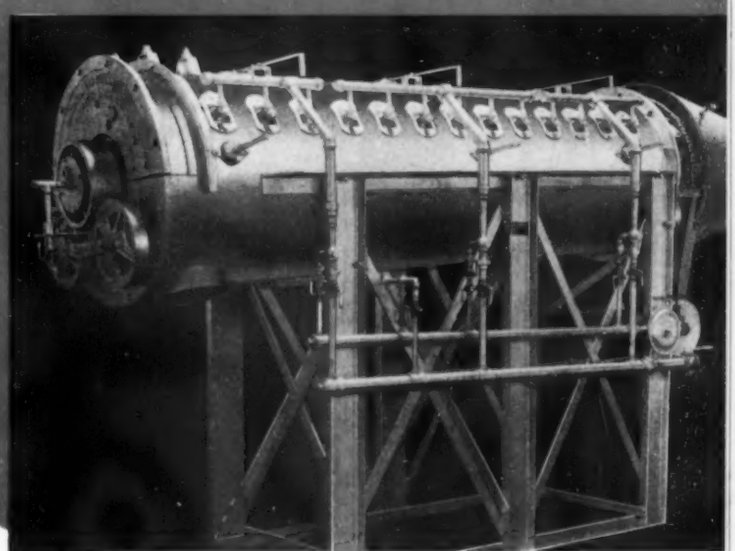
Utility Bench Forge — For quickly heating small pieces for forgings, bending, tool dressing, hardening or annealing tools, brazing, etc. Forging heat attainable in two minutes.



No. 16-F Tool Room Oven—For hardening, annealing, tempering, box carburizing, etc. Uniform temperatures to 1800° F. are quickly attained in its insulated chamber. Hearth is 8" x 14".



Pot Tempering Furnace—For tempering in a fluid such as oil or tempering salts. A light-weight insulating lining reduces heat storage, thereby eliminating temperature overriding difficulties.



AMERICAN GAS FURNACE CO.

ELIZABETH, N. J.

Standardize on AMERCUT

. . . *and you'll get* Better Workmanship and Better Parts

THE cold drawing operation employed in the manufacture of AMERCUT Cold Finished Steel Bars improves the physical properties of the steel, a factor which adds higher quality and durability to the parts you manufacture. Their uniform structure reduces wear on tools, which provides a saving in tool costs as well as the assurance of parts that are accurate in all dimensions.

Always look for the AMERCUT tag on your Cold Finished Bar shipments. These bars have a reputation for quality that has been built and maintained for over half a century. You can standardize on AMERCUT Bars for all machined parts because they are available in any grade you need and can be produced in the exact shape, finish and analysis you require. We will be glad to furnish you with technical assistance at any time. Send for our complete catalogue.

AMERICAN STEEL & WIRE COMPANY

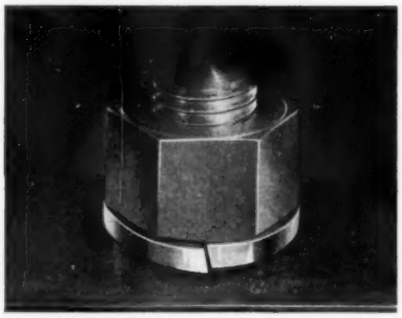
Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

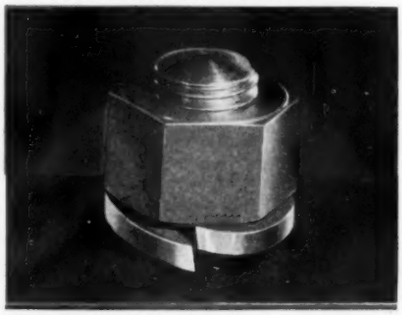
United States Steel Export Company, New York

UNITED STATES STEEL

Nut is tightened by setting up pressure on the threads.



The Helical Spring Washer compensates for the initial causes of looseness.



The Helical Spring Washer maintains adequate thread pressure *over a long range!*

A mere temporary biting hold "does the trick" here ...

but it can't "do the trick" in keeping bolted parts tight

Maintaining adequate pressure on the threads *over a long range* is the *only* means of keeping bolted parts tight. Any device with teeth that bite into the bearing surfaces cannot maintain adequate pressure *over a long range.* The more "bite" due to vibration—the less pressure on the threads.

The initial cause of looseness is never backward turning of the nut. It is bolt stretch, wear of contacting surfaces, or break-down of rust, scale or paint. A Helical Spring Washer is the *only* device that compensates for these initial causes of looseness by maintaining adequate pressure on the threads *over a long range.*

SPRING WASHER INDUSTRY, Wrigley Bldg., Chicago

Only a Helical Spring Washer maintains thread pressure continuously over a long range

Modernize

FOR HIGHER PRODUCTION AT LOWER COST . . . WITH . . .

AUTOMATIC DRILLING *by the* KINGSBURY METHOD

With modern Kingsbury "FLEXIMATIC" multi directional chucking machines on your production line your problem of maintaining high accuracy on high production schedules is solved. Cost per piece is vastly reduced, making the use of these modern fast machines of outstanding value as a method of modernizing production operations.

As a cost-conscious production man, it will pay you to ask us to help you determine the profit making capacities of these Kingsbury Automatic Indexing Machines. Our engineers will gladly cooperate with you and give you time and cost estimates on producing your work by the Kingsbury Method.

SAVE TIME AND MONEY IN DRILLING TAPPING COUNTERBORING REAMING FACING SAWING and LIGHT MILLING

The KINGSBURY FLEXIMATIC

The machine illustrated is equipped with air operated two jaw self centering chucks. The chucks open automatically as the turret is indexed into the loading station.

Made in the following turret sizes: 12", 20", 30", 40", 50". Complete detailed specifications available on request.

Kingsbury Machine Tool Corp. KEENE NEW HAMPSHIRE

ORIGINATORS OF THE AUTOMATIC DRILLING HEAD UNIT

MODERNIZATION *Begins in the Tool Room*

BRING YOUR TOOL RECONDITIONING DEPARTMENT UP-TO-DATE *with* EFFICIENT.. ACCURATE OLIVER TOOL CONDITIONERS:

OLIVER NO. 510 DRILLPOINTER

Automatic operation produces the patented Oliver point with variable clearances. Takes drills from ¼" to 3" in diameter, and produces any point angle from 82 to 160 degrees. TIMKIN equipped grinding spindle. This unit gives you the *right point* for the material being drilled.

NEW! UNIVERSAL TOOL AND CUTTER GRINDER

NEW STYLE! NEW LINES!
NEW SIMPLIFIED FIXTURES!

With a few simple fixtures, grinds face mills, slitting saws, end mills, angular cutters, slab mills, spot facers, formed cutters, reamers, gear cutters, etc. Produces accurate clearances by direct reading—uniform teeth, correct angles and straight cutting edges that mean better tool service. Work is held stationary and grinding wheel traverses tooth, adding to the ease and accuracy of operation.

• *Modernization Begins in the Tool Room.* The first step in bringing your production up-to-date is an installation of tool reconditioning units that will give you accurate, efficient resharpening jobs.

OLIVER TOOL CONDITIONERS *do just that:*

Oliver Ground drills are perfectly balanced, with a hollow ground point that means improved performance. Oliver reconditioned Drills and Cutters stay on the job longer between grinds. USE Oliver Tool Conditioners, they remove the "Human Element" —they will give you production—precision and all around tool savings.

REMEMBER . . . as Tool Room modernization goes, so goes production . . . To Modernize with OLIVER Tool Conditioners means that increased production efficiency will follow.

So . . .
LET US DESIGN A TOOL ROOM FOR *YOU* . . . ONE THAT WILL KEEP IN STEP WITH YOUR MOST EFFICIENT PRODUCTION DEPARTMENT. WRITE FOR COMPLETE DETAILS CONCERNING OUR SERVICE.

DON'T NEGLECT YOUR TOOL ROOM
It's the Backbone of Production!

OLIVER INSTRUMENT CO.
1410 EAST MAUMEE ST.
ADRIAN • MICHIGAN • U. S. A.

OLIVER OF ADRIAN PRODUCTS

OLIVER OF ADRIAN

AUTOMATIC DRILL GRINDERS • TAP GRINDERS • FACE MILL GRINDERS • TOOL AND CUTTER GRINDERS • DRILL POINT THINNERS • DIE MAKING MACHINES

WHEN IS OVERHEAD *Profitable?*

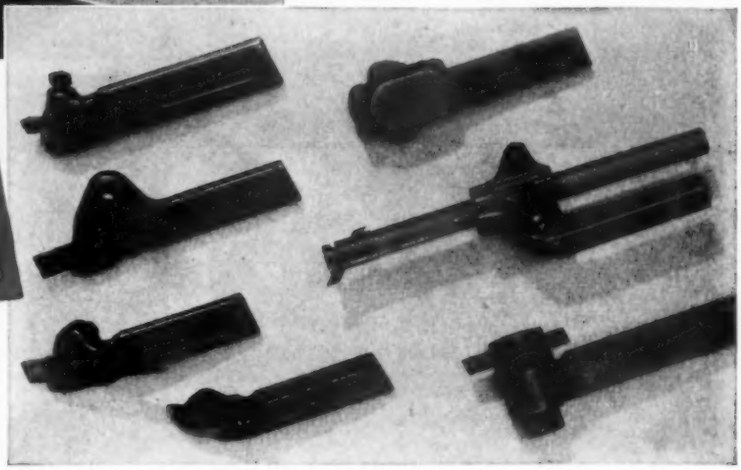
Your toolroom investment can be a profit-maker for you through wise choice of equipment. Adaptability of GORTON machines, described in these booklets, makes it profitable to produce types of dies and molds previously impossible or impractical because of design or accuracy limitations. Any of these booklets will be sent to you promptly at your request. Write today!

GEORGE GORTON MACHINE CO.

1103 13TH STREET, RACINE, WIS., U. S. A.

INCREASE MACHINE OUTPUT WITH THESE IMPROVED TOOLS

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
IMPROVED TOOL HOLDERS



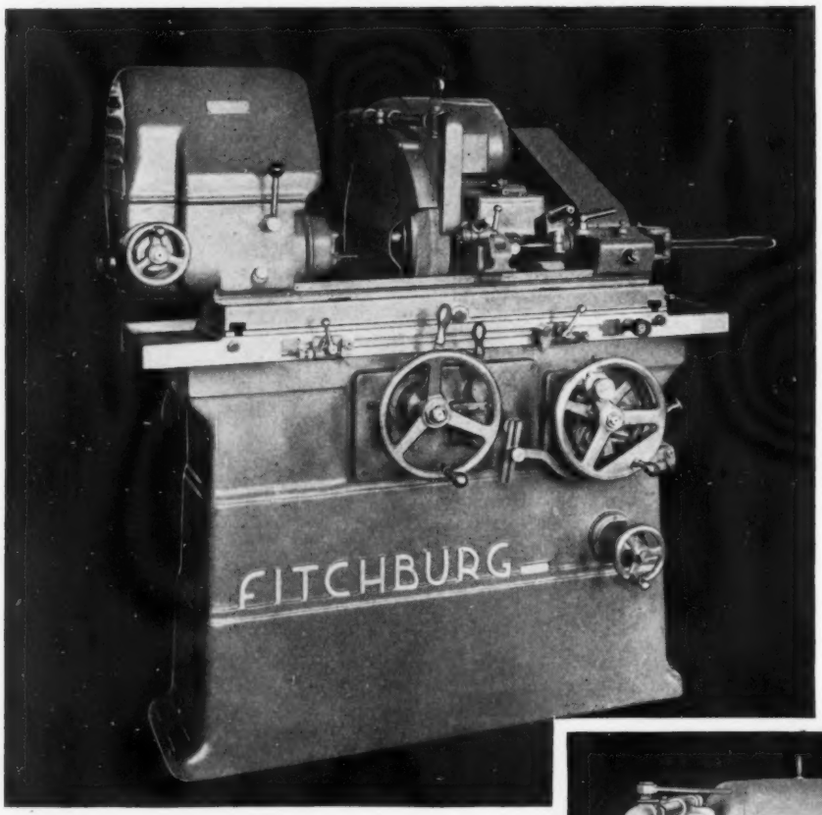
Williams' Tool Holders offer many advantages which can be definitely measured in terms of better lathe performance and greater machine output. In the Turning Tool shown above, for example, the cutter holding channel is unusually long and broached with extreme accuracy. Williams' Holders are specially hardened so as to insure a solid cutter seat even after continued use of short bits. Tool chatter and breakage of costly high-speed cutters are avoided.

In the boring, planing, cutting-off and side tools shown in the panel illustration, you will find other advantages that are exclusively Williams. Williams' improved line includes holders for every regular operation on lathe, planer, shaper, etc., including Carbide Turning Holders for square and flat cutters and Spring Cutting-off Holders. Ask your jobber or write for illustrated literature.

1-608

J. H. WILLIAMS & CO. HEADQUARTERS FOR **225 LAFAYETTE ST., NEW YORK**

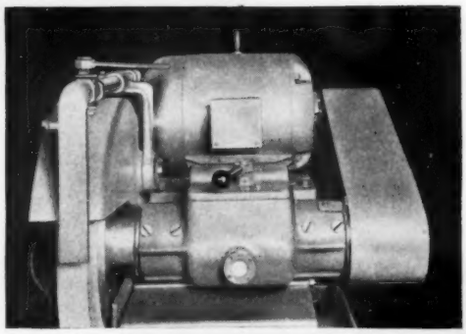
» » FITCHBURG « «



35 YEARS' GRINDING EXPERIENCE

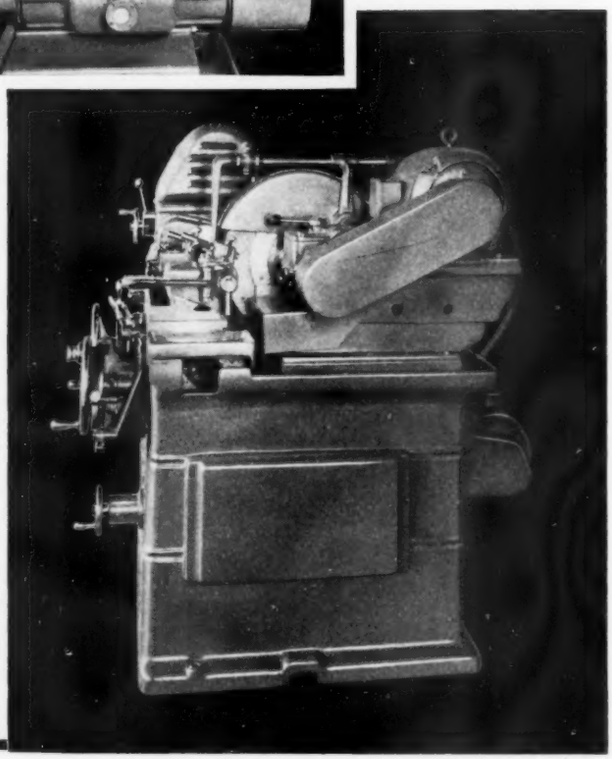
is in the design of this

NEW FITCHBURG PLAIN CYLINDRICAL GRINDER



SPECIFICATIONS

Two Sizes	6″ x 18″ and 6″ x 32″
Grinding Wheel	20″ x 2″ x 12″
Work Speeds	90—575 R.P.M.
Table Speeds	28″—188″ P.M.
Table Graduated	10°
Wheel Speed	1238 and 1460 R.P.M.
Distance Floor to Centers	42″
Floor Space	18″—80″ x 60″, 32″—104″ x 60″
Weight	18″—4200 lbs., 32″—4400 lbs.



All speed changes are controlled by variable pitch sheaves.

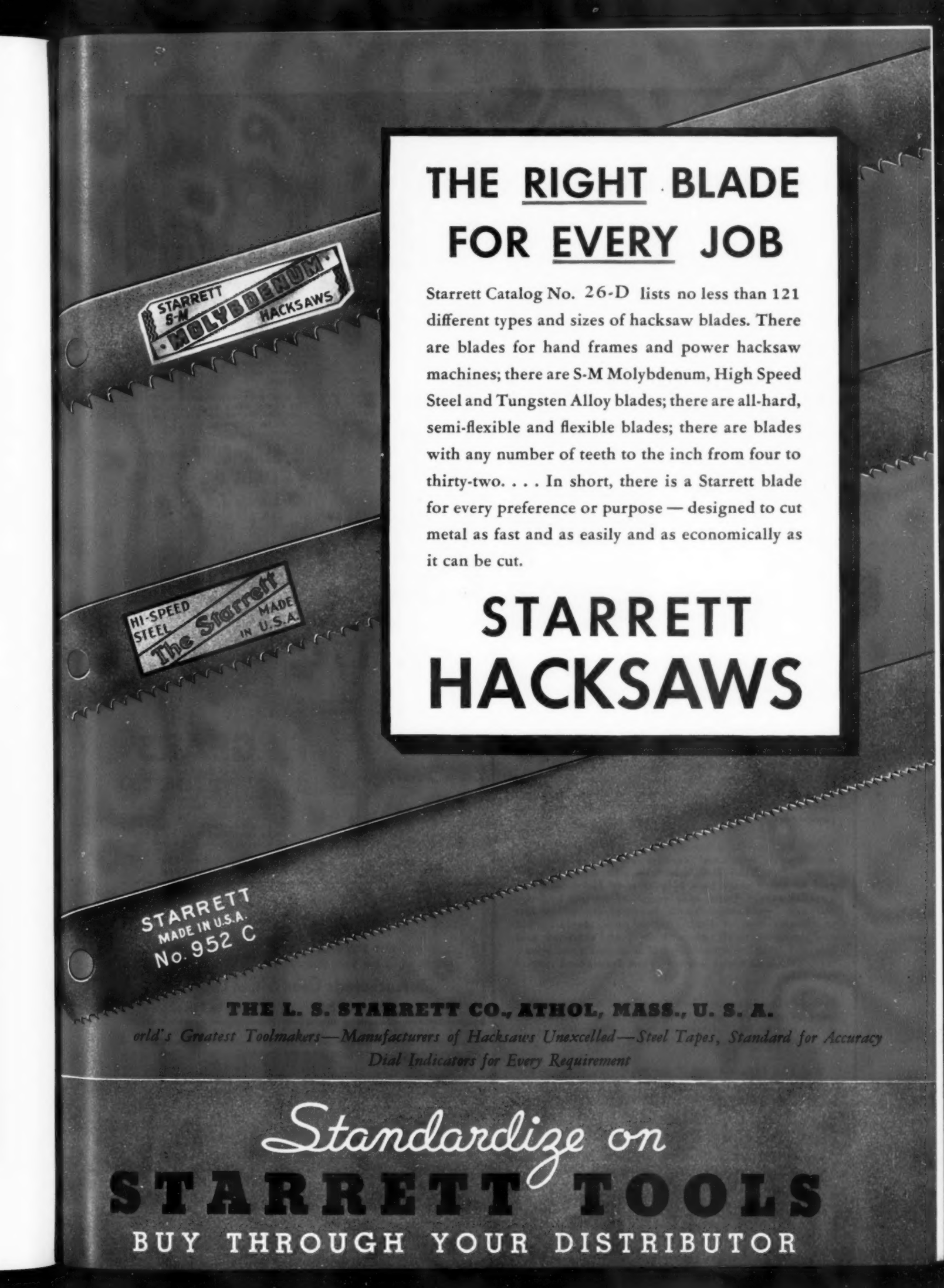
Infinitely stepless adjustments from minimum to maximum for both table and work speeds.

Pressure spindle lubrication for low viscosity oils allowing—

Close bearing clearances for precision sizing.

Complete details upon request.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASS., U. S. A.



THE RIGHT BLADE FOR EVERY JOB

Starrett Catalog No. 26-D lists no less than 121 different types and sizes of hacksaw blades. There are blades for hand frames and power hacksaw machines; there are S-M Molybdenum, High Speed Steel and Tungsten Alloy blades; there are all-hard, semi-flexible and flexible blades; there are blades with any number of teeth to the inch from four to thirty-two. . . . In short, there is a Starrett blade for every preference or purpose — designed to cut metal as fast and as easily and as economically as it can be cut.

STARRETT HACKSAWS

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

orld's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled—Steel Tapes, Standard for Accuracy
Dial Indicators for Every Requirement

Standardize on

STARRETT TOOLS

BUY THROUGH YOUR DISTRIBUTOR

FOR HIGH-SPEED, ECONOMICAL PRODUCTION OF ACCURATE GEARS

FARREL-SYKES GEAR GENERATORS

(Above) A Farrel-Sykes Gear Generator installed in a large oil field machinery plant.

(Right) Generating a continuous tooth herringbone pinion in a Farrel-Sykes Gear Generator.

Their demonstrated ability to generate precision gears economically at a speed that assures bigger output is a distinguishing feature of Farrel-Sykes Gear Generators. The earning capacity of these machines is high, their performance trouble-free and their maintenance cost low.

Farrel-Sykes Gear Generators will maintain for many thousands of hours the exceptional precision built into them initially. Hardened, ground and lapped surfaces are used wherever wear is likely to affect precision, and means of compensating for wear are provided.

With the speed, precision and economy of these machines is combined another advantage—unusual versatility. They will generate with equal facility and accuracy every type of gear used for connecting parallel axes. Their wide range of output includes not only continuous tooth herringbone gears but any known type of double helical gear, single helical and straight tooth gears with both external and internal teeth, two members of a cluster gear simultaneously, and many other toothed forms and special contours.

Farrel-Sykes Gear Generators are built in six standard sizes to generate gears from the smallest practicable minimum to 264″ diameter, with face widths up to 60″ and pitches from 24 DP to 0.5 DP.

For Full Information Write for Catalog No. 440

FARREL-BIRMINGHAM COMPANY, INC.
355 Vulcan St., Buffalo, N. Y.

BRAUN

CALL BRAUN FOR QUICK, ECONOMICAL SERVICE . . .

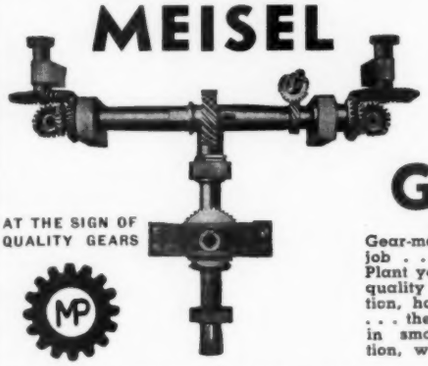
Our facilities include the most modern types of equipment for the production of all types of gears and pinions in any material or quantity. We are fully equipped to produce gears which involve cutting, grinding and heat-treating operations.

An estimate on your gear requirements will convince you that Braun offers an economical service. You can also depend on Braun for prompt deliveries in any quantity.

BRAUN GEAR CORP.
1590 ATLANTIC AVE.
BROOKLYN, N. Y.

BRAUN GEARS AGMA

MEISEL



GEARS

AT THE SIGN OF QUALITY GEARS

Gear-making is a specialist's job . . . here at the Meisel Plant you are assured of first-quality in design, construction, hardening and finishing . . . the result manifests itself in smoother, quieter operation, with less "down" time.

MEISEL PRESS MFG. CO.
946 Dorchester Ave.
BOSTON, MASS.

SMALL GEARS

ALSO MEDIUM SIZES IN ALL TYPES AND MATERIALS
Hobbed Pin Rod, Spur, Spiral and Worm Rod

Massachusetts Gear & Tool Company
Nashua St. Woburn, Mass.

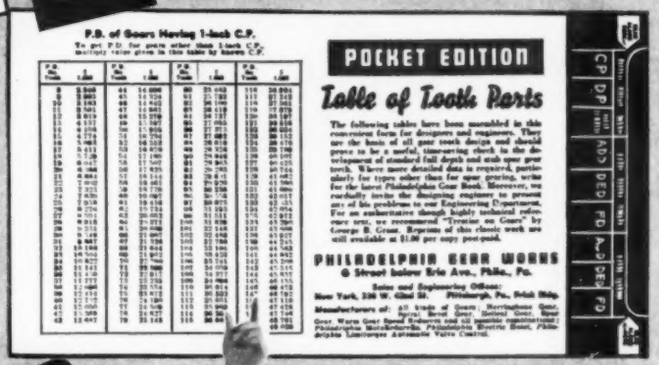
GEARS - WORMS - CAMS - MADE TO ORDER

HARTFORD GEARS

THE HARTFORD SPECIAL MACHINERY CO., Hartford, Conn.

FREE

A HANDY CALCULATOR FOR ENGINEERS AND DESIGNERS



MAIL THIS COUPON

. . . and we'll send you, without charge or obligation, one of these slide calculators containing numerous tables which are the basis of gear tooth design. It will save you time in the development of standard full depth and stub spur gear teeth. Get yours now.

—PHILADELPHIA GEAR WORKS
Erie Ave. & G St., Phila., Pa.

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TITLE _____

FIRM _____

ADDRESS _____

AM 5-29

Philadelphia LIMITORQUE CONTROL operates all types of valves, etc., safely, economically, from convenient stations.
Philadelphia WORM GEAR SPEED REDUCER right angle drives—vertical or horizontal. Wide range of ratios and horsepowers.
Philadelphia HERRINGBONE SPEED REDUCER for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.
Philadelphia MOTOREDUCER The economical self-contained drive. Horizontal or Vertical types—various ratios and horsepowers.
Philadelphia GEARS All types and sizes of industrial gears. Can be supplied in all materials.

PHILADELPHIA GEAR WORKS

Industrial Gears and Speed Reducers
Erie Ave. and G St.
Philadelphia, Pa.
New York • Pittsburgh • Chicago

PERKINS GEARS WORMS
for *Precision* requirements

You can depend on precision work to your most exacting specifications when you make Perkins responsible for the production of your worm, helical, spiral and bevel gears.

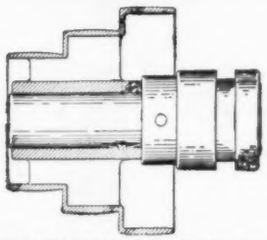
High precision and uniformly high quality are duplicated on every order for Perkins Gears regardless of the quantities involved.

As specialists in gears for precision work, Perkins offers you Custom Cut Gears that insure the utmost in efficiency, long service and economy.

Send us your specifications. Ask for estimates on any type or quantity.

PERKINS MACHINE & GEAR CO.
110 Circuit Ave. SPRINGFIELD, MASS.

THE JOHNSON FRICTION CLUTCH



Single Clutch with Cone Pulley on Hub

Johnson equipped Cone Pulleys, for use on Line shaft are installed in many Factories and are used particularly, in the Manual Training Departments of,

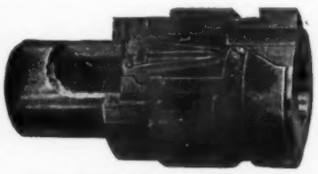
TECHNICAL HIGH SCHOOLS AND UNIVERSITIES

A Johnson Line Shaft Drive is the modern way to apply "Modern Group Drive" to production machines.

By eliminating countershafts, less equipment is involved, set-up cost is reduced, space is saved, belt troubles and maintenance are minimized and power is conserved.

Modern practice discards the countershaft for the simplicity and efficiency of the clutch drive — with Johnson Friction Clutches —direct from the line shaft.

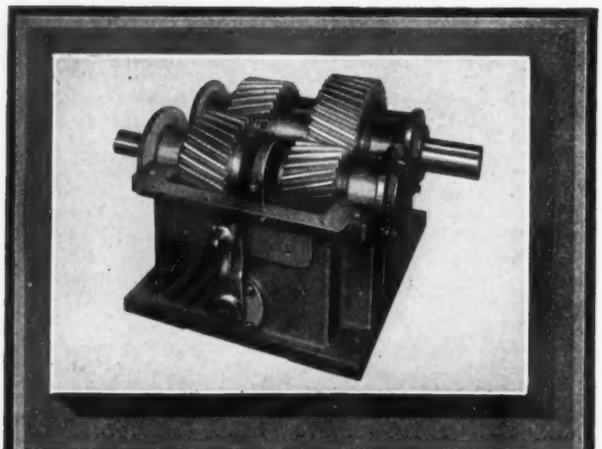
Write for details.



Single Clutch showing working parts.

Write for Blue 1940 Clutch Catalog No. 55

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



GRANT

Complete ranges of sizes from fractional to 100 h.p. Reductions up to 4000 to 1.

GRANT GEAR WORKS–Boston

BILGRAM QUALITY GEARS

Since 1880

HYPOIDS
ANY RATIO

ALL TYPES • ALL MATERIALS

BILGRAM GEAR AND MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

GANSCHOW GEARS

FOR SIXTY YEARS

Spur – SPEED REDUCERS – Worm
ALL TYPES OF CUT GEARS

GANSCHOW GEAR CO., 1007 W. Washington, Chicago

FINE GEARS of All Types and Sizes
Spur Gears—½ in. to 30 ft. in diameter
Bevel Gears—½ in. to 13 ft. in diameter
Spiral Gears—½ in. to 10 ft. in diameter
Worm gears in any practical size
THE EARLE GEAR & MACHINE CO.
4723 Stenton Ave. Philadelphia, Pa.
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EARLE GEARS

Small

MITRES-
BEVELS

10 to 48 D.P.
under 6" P.D.

The very latest development in Small Bevel Gear Generating machines are at your disposal here to make such Gears *right* in every particular . . . What are your requirements?

ALSO
SPURS—SPIRALS—WORM GEARING

Made to order only No stock No catalog

Gear Specialties
INCORPORATED
CHICAGO

2600 W. MEDILL AVE. Phone Humboldt 3482

Janette Speed Reducers

1/50 TO 10 H.P. .08 TO 1140 R.P.M.

Janette speed reducers are compact, ruggedly constructed, pleasing in appearance, easy to install or maintain, reasonably priced, built complete and guaranteed by ONE organization. 43 sizes and types of reducers are available.

As adjustments and maintenance on belts, pulleys, chains or slide rails are not necessary, delays in production can be reduced by using speed reducers. Better lighting is possible, as overhead belts, pulleys, hangars and line shafting can be eliminated.

Illustrating the SG style helical gear, parallel shaft reducer.

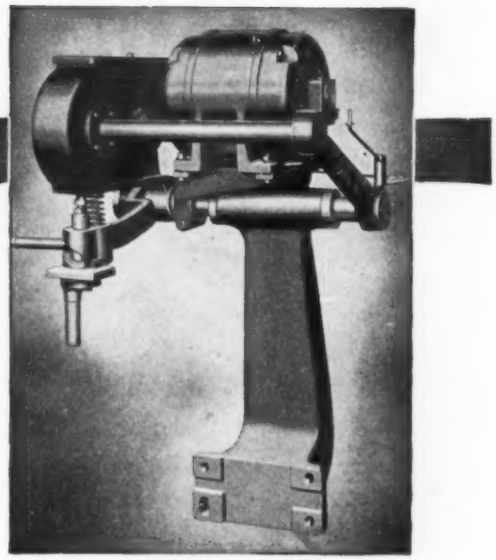
Write for our 100 page bulletin
Motor Generator Sets—Converters—Blower Wheels

Janette Manufacturing Company
558 West Monroe Street Chicago

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

G E A R S
Spur - Helical - Bevel - Worms - Screws - Racks
Gear Hobbing - Thread Milling - Broaching
THE ADAMS COMPANY (*Est. 1883*) 1900 Bridge St. Dubuque, Iowa

MODERN DESIGN FOR MACHINE DRIVE APPLICATION



CULLMAN
Motor Drive Unit

Operated with Instant, Convenient Control and Belt Drive Smoothness

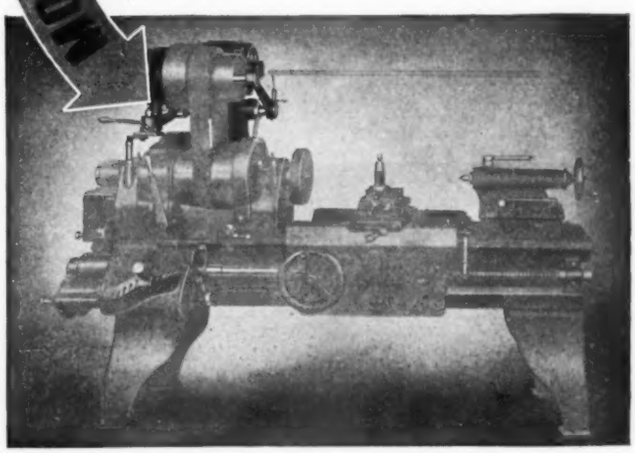
The Cullman Drive is an individual Electric Motor Unit designed to eliminate countershaft and overhead belting arrangements formerly used to drive Cone Pulley Machines.

It increases machine efficiency 25%. Any lathe, shaper, milling machine, screw machine, or punch press can be modernized at surprisingly low cost by the installation of the Cullman Drive. It is simple in construction, efficient in operation and built for long service. Made in sizes for motors ranging from ¼ to 15 H.P.

A 60-day FREE TRIAL, without obligation, will convince you of the value of Cullman Drives.

Write today for full information regarding this remarkable Motor Drive Unit now used by many leading companies.

CULLMAN WHEEL CO.
1349 ALTGELD ST. CHICAGO, ILL.



WE MADE MOVIES OF AN ARC

TO SHOW YOU HOW
"De-ion"
PROTECTS CONTACTS
IN THE
MOTOR
WATCHMAN
2,000 PICTURES PER SECOND
Illustrated above is one of the pictures taken at a speed of 2,000 photographs per second by a high speed camera. It shows exactly what happens to an arc in the "De-ion" arc chute. At the left is shown a diagram of "De-ion" action.

Until Westinghouse took movies of an arc showing the "De-ion" arc quencher in action, no one, including the scientist who developed the "De-ion" principle, had ever seen *exactly* what happened to the arc. Under the eye of the high speed camera, it was possible to see for the first time how "De-ion" saves contacts. The pictures showed that the instant the arc was formed it was immediately drawn into the arc chute away from the contacts, and snuffed out. These pictures showed why contacts in the Motor Watchman have longer life—how "De-ion" prevents dangerous arc flashes—advantages that pay dividends in reduced maintenance and greater safety.

Other advantages of the Westinghouse Motor Watchman include: Bi-Metal protection against overloads • foolproof safety lock • indicating handle • easy installation • small, compact design.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
East Pittsburgh, Pa.

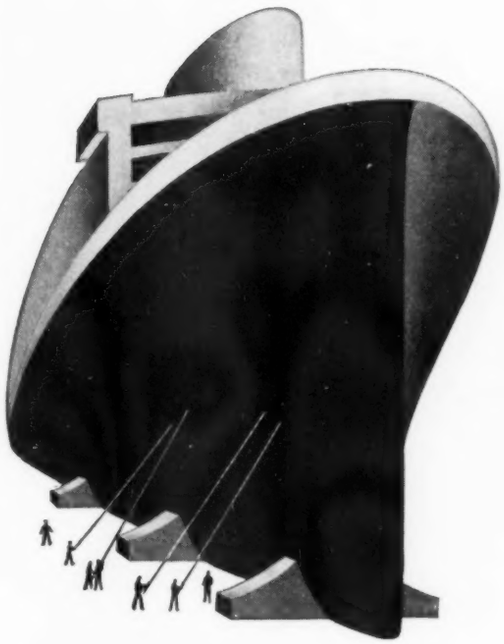
J-21091

WESTINGHOUSE "DE-ION" MOTOR WATCHMAN
The motor starter for motors up to 7½ hp. "On," "Off" and "Tripped" positions clearly visible.

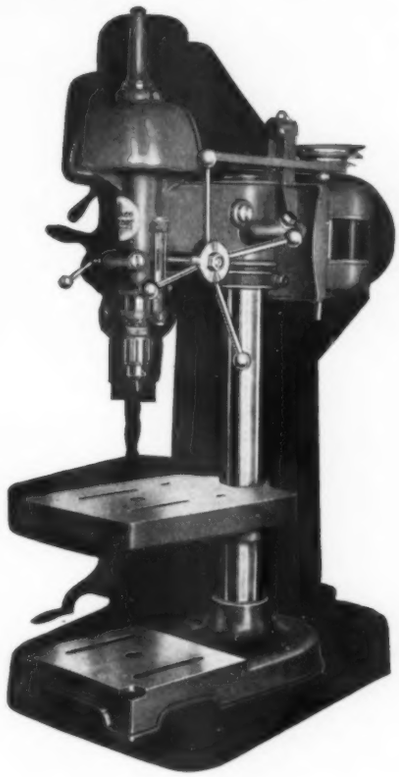
Westinghouse

"DE-ION" MOTOR WATCHMAN

W
WESTINGHOUSE ELECTRIC



Scrape Off THE BARNACLES



BARNACLES respect nothing. They attach themselves to a fine liner as readily as to a lowly freighter. So, too, barnacles of habit fasten to even the best business until an alert management scrapes them off.

One barnacle that slows many a concern is the use of heavy machine tools for jobs that can be done as well on less expensive machines. In such cases costs are higher than necessary, because of the extra initial investment, power consumption, floor space, upkeep, labor, etc., etc. Fitting the machine to the job offers substantial savings over the use of heavy machines for all work regardless of requirements.

WALKER-TURNER MACHINE TOOLS, designed for correct relationship between factor of safety and weight, are keeping production costs low for hundreds of prominent manufacturers. In these days of deferred deliveries, too, it is well to know that you can obtain practically immediate shipment of Walker-Turner Machine Tools.

DRILL PRESSES • LATHES • BAND SAWS • BENCH SAWS • TILTING ARBOR SAWS • JIG SAWS • RADIAL SAWS • BELT AND DISC SURFACERS • SPINDLE SHAPERS • JOINTERS • GRINDERS • FLEXIBLE SHAFT MACHINES

WALKER-TURNER CO., INC.
4550 Berckman St., Plainfield, N. J.

Please send me your 1940 catalog

Name_____ Title_____

Company_____

Street_____

City_____ State_____

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

WALKER-TURNER MACHINE TOOLS

FOR METAL, WOOD AND PLASTICS

MATTISON

HIGH-POWERED PRECISION SURFACE GRINDER

TABLE SIZES
From 12″ to 30″ wide
by 36″ to 192″ long

GREATER ACCURACY
BETTER FINISH
LESS TIME

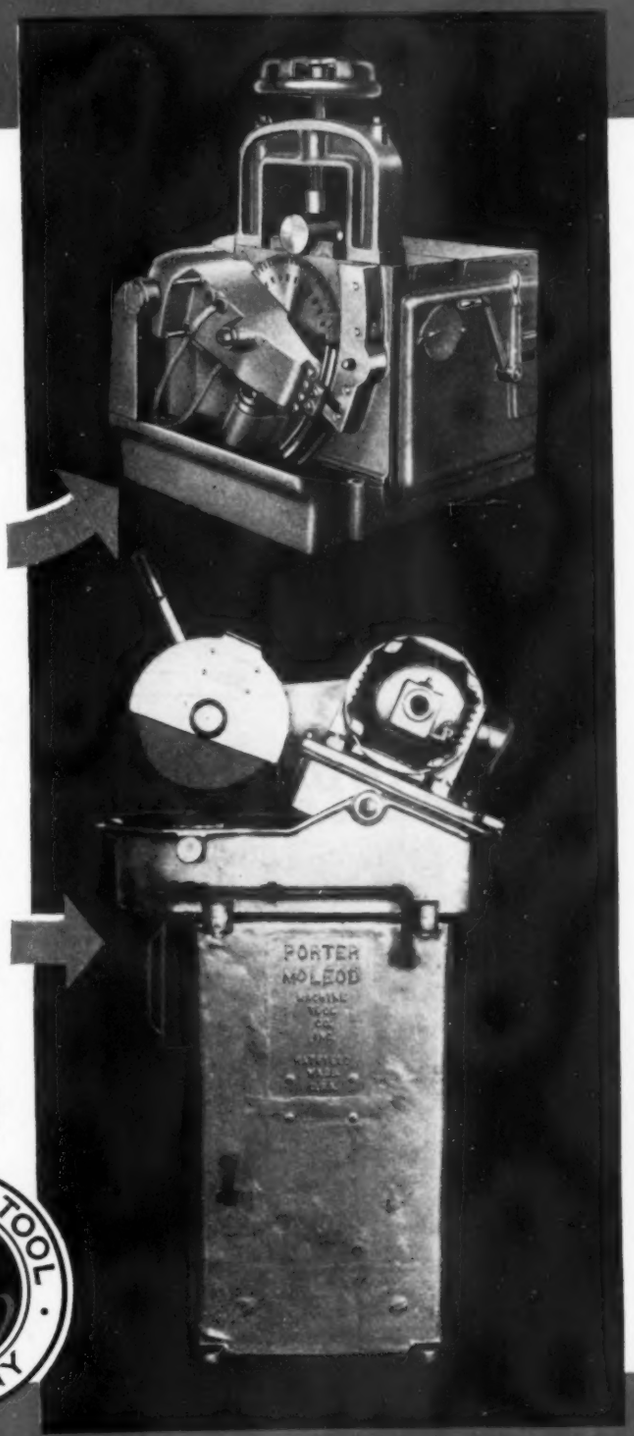
The sound, fundamental principles of construction which have permitted users of Mattison Surface Grinders to obtain close accuracy, fine finish, increased production, rapid stock removal and a quick return on their investment remain intact. However, there have been many refinements from time to time which will now make the Mattison, more than ever a machine to be considered in your efforts to lower costs and increase profits. Send for complete information.

MATTISON MACHINE WORKS—ROCKFORD, ILLINOIS

YOU CAN SAVE MONEY..

by HANDLING YOUR METAL SAWING AND CUTTING-OFF ON THESE

MODERN, FAST MACHINES



The 8″ Porter-McLeod Cold Metal Sawing Machine

This new machine has a capacity of 8 inch round and 7½ inch square. A special holding fixture makes it possible to handle multiple cutting up to the capacity of the machine. For example, it will cut three pieces of round stock 4½ inches in diameter simultaneously or smaller sizes in greater quantity.

Features of design which are well worth your investigation include: upward feed of blade to stock by which riding and bumping are prevented; friction disc feed which protects blades against breakage; pulling of blades through cut from in front of and below on a diameter well out from the center of the blade, a construction which eliminates weaving and buckling. These and other advanced features insure convenience, improved performance and worthwhile savings in cold metal sawing. Write for complete Illustrated Bulletin, giving detailed specifications.

The New One Inch Porter-McLeod Wet Abrasive Cutting-Off Machine

Designed for high speed work without discoloration, corrosion or splash, this new cutting-off machine insures fast, square, clean cuts. A turntable is provided which may be set in 5° steps in either direction for cutting at angles up to 45°. With special angle blocks available, this machine can be adapted to cutting any angle.

These machines are available in Bench and Pedestal Types and are equipped with 1½ H.P. motors driving spindle through three V-belts. On each type machine, coolant is brought in through the side of base and directed to a chamber directly under the turntable. Coolant then passes through an orifice in the center of the turntable to each side of work. This method of cooling keeps work cold, kills most of the spark and prevents discoloration. Splash also is eliminated.

Operating lever is arranged for convenient operation by either right or left hand.

Other important features and detailed specifications are available in Illustrated Bulletin which will be sent promptly on request.

MACHINE TOOL · MT · COMPANY

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U. S. A.

using **RHOADS**

TANNATE WATERSHED LEATHER BELTING

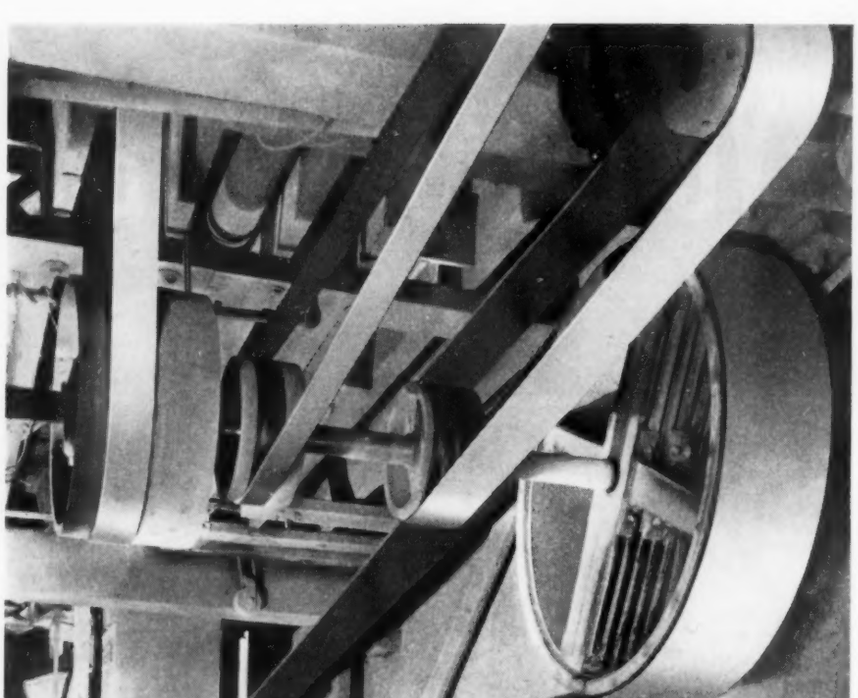
Specifications:

50 ft. of 12" double Tannate
Installed May 1925
Driver pulley 48"—Driven pulley 12"
40-50 H.P.
Large blower fan drive
Line shaft
Horizontal set up
Tight side at bottom
Conditions: somewhat dusty.

Performance:

Fifteen years of economical service—and it has been taken up only once. The flexibility and pull of TANNATE enabled the owners to dispense with the use of the idler.

Are you really satisfied with belt performances in your plant? If not, TANNATE performance offers you profit possibilities. Investigate. No obligation; just write—



J. E. RHOADS & SONS
Established 1702
35 N. SIXTH ST., PHILADELPHIA, PA.
NEW YORK CHICAGO ATLANTA CLEVELAND
Factory and Tannery—Wilmington, Del.

Are You Having Too Many Drive Failures in Your Plant?

TOTALLY-ENCLOSED and FAN-COOLED . . .

Specify HOWELL Type K Motors when you buy machine tools or other motor driven equipment—*that's a sure way to cut your drive costs to rock bottom.*

STREAMLINED housing, as shown, adds attractive appearance to internal quality. Sizes, ½ to 100 HP.

1915 · 1940 HOWELL MOTORS 25th Anniversary Year

Smart Operators Use These Protected Motors to STOP Production Losses

No metallic dusts, no corrosive fumes, no moisture can attack the windings in a HOWELL Type K.

Destructive elements are SEALED OUT by the motor housing which *totally-encloses* every working part.

Use these *protected* motors to STOP drive failures on all jobs where ordinary motors can't stand the pace . . . *many thousands now on duty in the automotive industry alone.*

WRITE FOR BULLETIN *See for yourself why HOWELL Type K Motors out-perform and out-last other types. Send for our Bulletin today!*

HOWELL ELECTRIC MOTORS COMPANY
HOWELL, MICHIGAN
Representatives In All Principal Cities

All the Precision of a Combat Formation

(Ryan STM Military Training Planes in Formation Flight)

If it's grinding—whether external or internal, on a lathe or a special machine tool set-up —you can depend on getting accuracy to a tenth (.0001″) with a Dumore. Call the Dumore distributor nearest you . . . he'll recommend the right one of many Dumore models—the exact model to fit your needs. Through him you are offered the advantages of over a quarter-century of specialized precision grinder manufacturing experience.

THE DUMORE COMPANY
DEPT. 130-E, Rracine, WISCONSIN

Dumore
No. 12
"Chief"

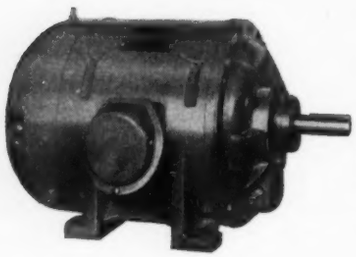
ONLY DUMORE GIVES YOU ALL OF THESE

- Lightweight for easy portability . . . yet sturdily built for long life.
- Spindle speeds up to 42,500 r.p.m. . . . without vibration.
- Wide selection of internal and external quick-change quills.
- A size of grinder for every job. . . . 15 models to select from.
- A background of 25 years' precision grinder specialization.
- Top ranking distributors conveniently located for quick service.

Dumore PRECISION *Grinders*

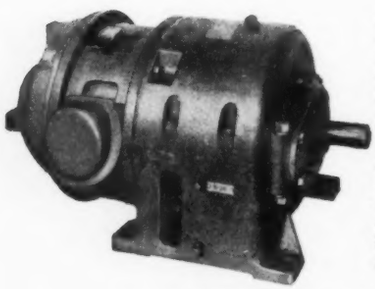
MODERN DRIVES PAY GOOD DIVIDENDS

MOTORS THAT CUT COSTS



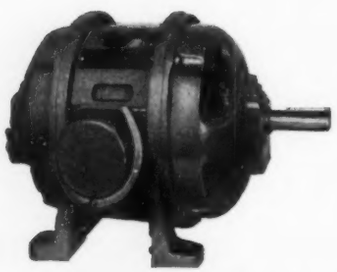
Protected from dust, dirt and moisture — the electrical working parts in the Westinghouse totally enclosed, fan-cooled motor are sealed from outside air, cooled by dual ventilation. Stand up in service that would ruin an ordinary motor — save maintenance cost and machine time.

TOTALLY ENCLOSED MOTORS



High speed motor efficiency for low speed machines—exact horsepower needed at the required rpm of the driven machine, all in one space-saving gearmotor. Simplifies installation, eliminates maintenance of belts, pulleys, sprockets, and chains. Delivers 96 to 98% of the motor's efficiency.

GEARMOTORS



Built for a lifetime— Westinghouse standard a-c motors deliver trouble-free performance. Rigid, one-piece frame, sealed sleeve bearings and Tuffernell insulation keep maintenance and power costs down — give you moneysaving features at no extra cost.

GENERAL PURPOSE MOTORS

CONTROLS THAT SAVE TIME AND MONEY

NOFUZE CIRCUIT BREAKERS

Save man hours and outage time—with Westinghouse Nofuze Circuit Breakers. Protects motor circuits — interrupted circuit can be restored instantly without time and expense of fuse replacement.

COMBINATION LINESTARTERS

Save cost on control installation — combine all needed motor and circuit protection into one compact package by using Westinghouse Combination Linestarters. Save space, labor, conduit and wiring.

Westinghouse

WESTINGHOUSE ELECTRIC

$2550 return from $960 Investment

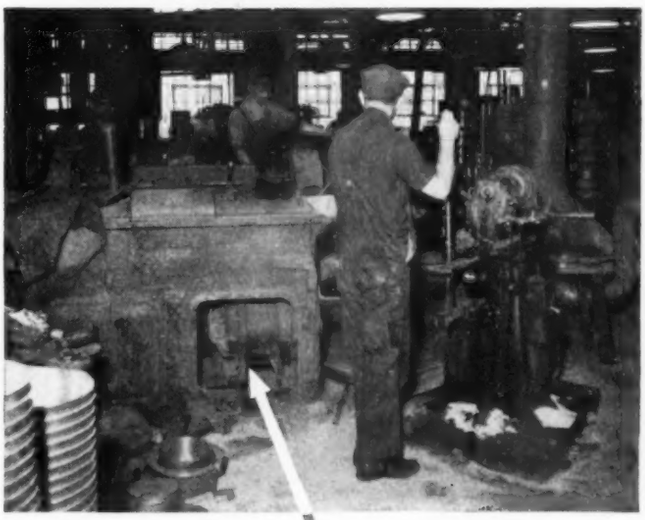
Six Westinghouse fan-cooled motors replace ordinary types—save 36 burnouts a year—slash maintenance almost to zero—and help speed up production.

Abrasive dust in the plant of the National Pressure Cooker Company was tough on ordinary open type motors. They were burning out about three every month. Repair costs piled up to $3000 a year — in addition to production time lost while machines were out of service.

The Westinghouse Industrial engineer suggested totally enclosed, fan-cooled motors. The first order cost $960. And since then, burnouts average less than two per year! A net saving of $2550 on a $960 investment!

If *you* want to save on maintenance and power—reduce outage time—cut manufacturing costs—make more profit—ask your local Westinghouse representative for suggestions. Or, write Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Address Department 7-N.

Dust and dirt can't hurt this Westinghouse totally enclosed gearmotor, operating buffing machine.



Cover on drive box on this grinder doesn't keep out metallic dust — but the casing on the totally enclosed motor takes it without flinching. Maintenance and repair costs practically zero.

There is a Westinghouse electrical wholesaler, industrial agent, or district office in all principal cities.

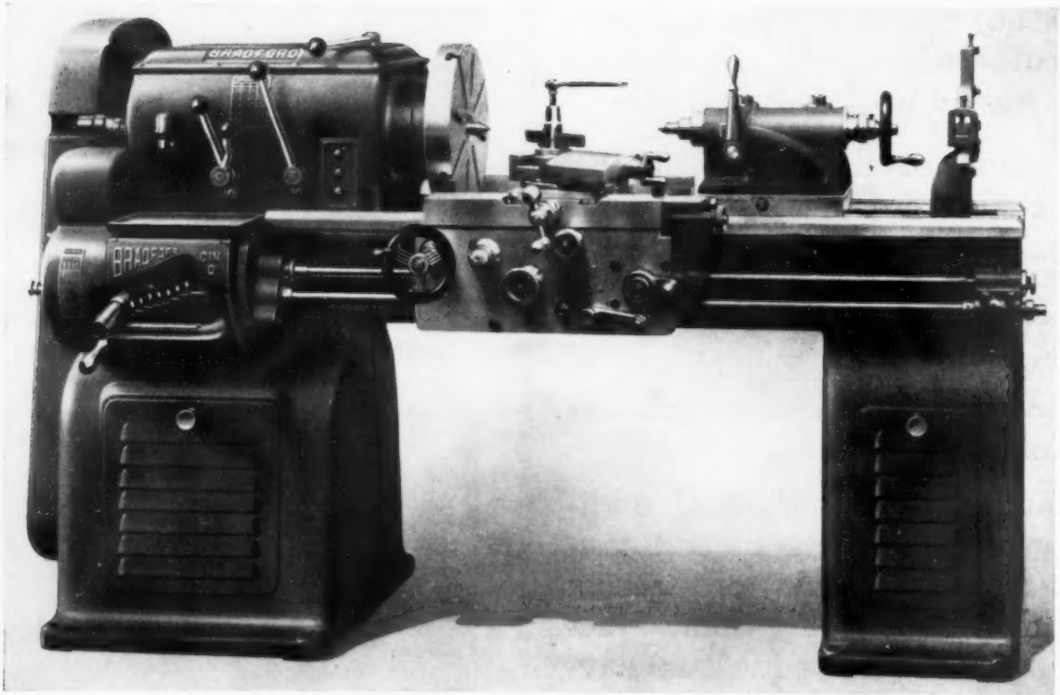
J-90214

Motors and Control

MODERNIZE

with the NEW 1940 BRADFORD GEARED HEAD

LATHES 12"-14"-16"



100 YEARS OF PROGRESS 1840-1940

Note these modern features—the result of 100 years of building QUALITY MACHINE TOOLS

- . . . 12 selective Speed Geared Head
- . . . Speed range from 16 to 400 RPM
- . . . Timken Bearings or Taper Bronze Bearings on high carbon steel main spindle
- . . . hardened alloy steel gears running in oil
- . . . Vee belt drive from constant speed reversible standard Nema frame motor mounted in cabinet leg under headstock
- . . . provision for convenient lubrication of all wearing surfaces
- . . . quick-change gear box arranged for selective feeds and thread-cutting; range of threads and feeds are unlimited
- . . . screw cutting and feed without removal of a gear

Send for FREE copy of bulletin giving complete, valuable information on the NEW BRADFORD—detailed specifications—attachments—and you'll be convinced that these lathes offer you everything you need for handling your work better and at lower cost.

THE BRADFORD MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.

The set screws that STAY SET!

UNBRAKO

Fig. 1641

SELF-LOCKING HOLLOW SET SCREWS

with the Knurled Points

Ever since their introduction to industry two years ago, "Unbrako" Self-Locking Hollow Set Screws have been news every day in the week . . . news that means greater safety, freedom from breakdowns and savings in maintenance dollars.

Just set them up with no more than ordinary pressure and the knurled cup points automatically lock into place with a lasting vibration-defying grip. Yet "Unbrako" Self-Lockers are easily backed off and they may be used over and over again, as often as you please—always with the same effectiveness.

For these money and trouble saving advantages, be sure to specify "Unbrako".

Fig. 1434 Knurled "UNBRAKO" Socket Head Cap Screw

KNURLED UNBRAKO SOCKET HEAD CAP SCREWS

The distinctive cold forged heads—knurled to insure a non-skid grip—save production time in setting up. And improved new alloys, modern heat treating methods, precision machining and careful inspection are four added reasons why "Unbrako" Socket Screws qualify for dependable service on your toughest jobs. Investigate them!

Fig. 1446 Knurled Socket Head Stripper Bolt

Write for Catalogs and Samples

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA.

BOX 4

BRANCHES
BOSTON
DETROIT
INDIANAPOLIS

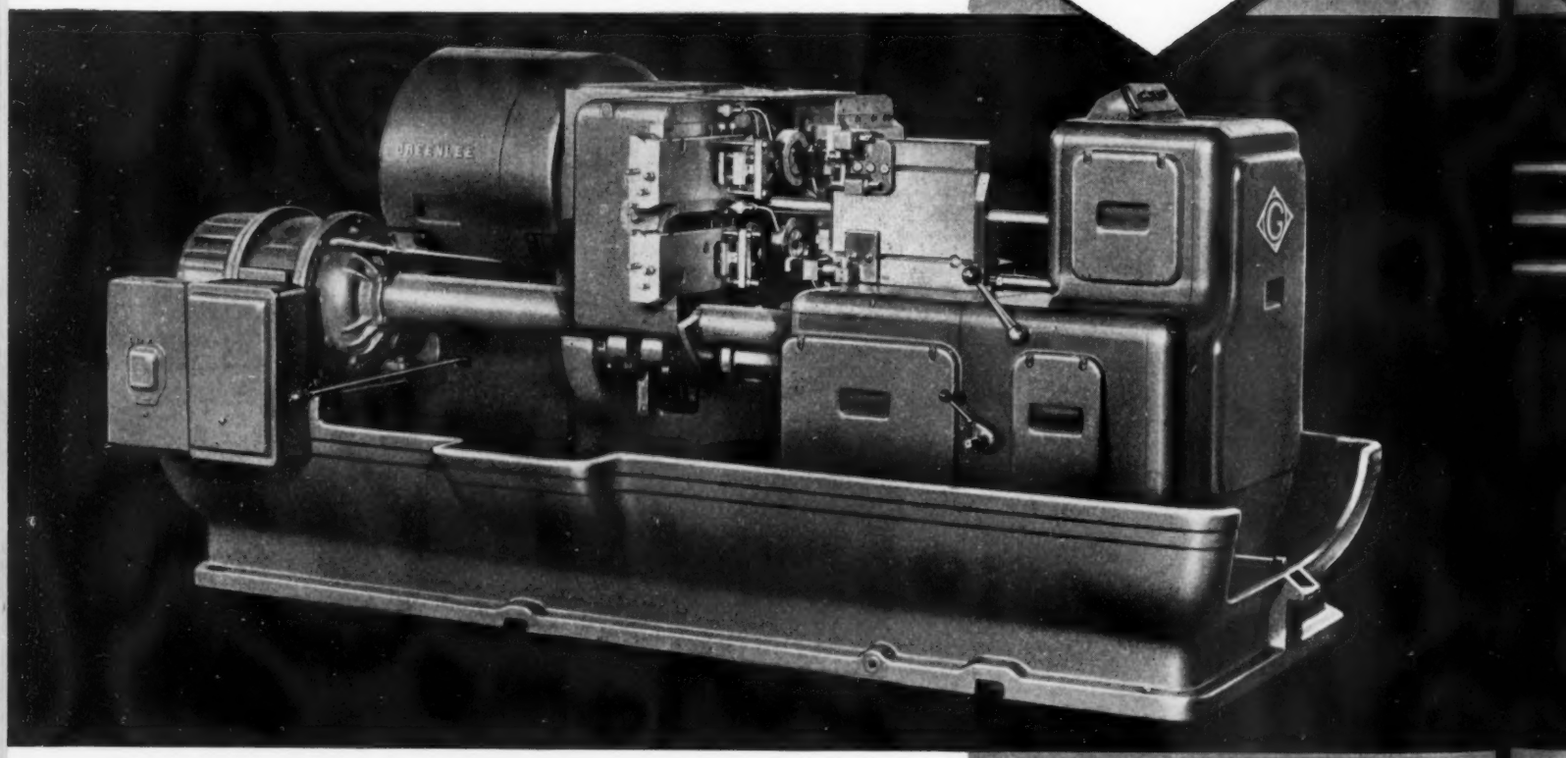
BRANCHES
CHICAGO
ST. LOUIS
SAN FRANCISCO

WHEN YOU INSTALL A

GREENLEE

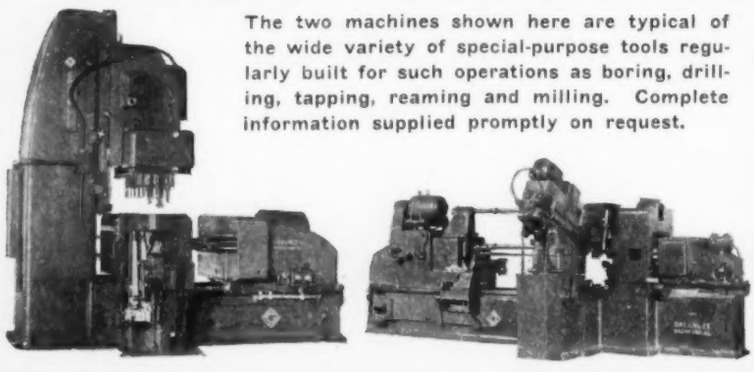
4 OR

The excellent record made by Greenlee Four-Spindle Automatics under all kinds of conditions is the result of sound engineering, extensive machine-building experience, and a combination of features in the design, which provide maximum production, continuous accuracy, quick change-over, and minimum down time. Now, with Greenlee Six-Spindle Automatics making the same kind of a record and for the same reasons, you have a wider choice in selecting a machine to suit your needs. Both types have the same strong basic design, which insures long life, dependability and high production.



★ ★ ★ GREENLEE Special-Purpose Tools

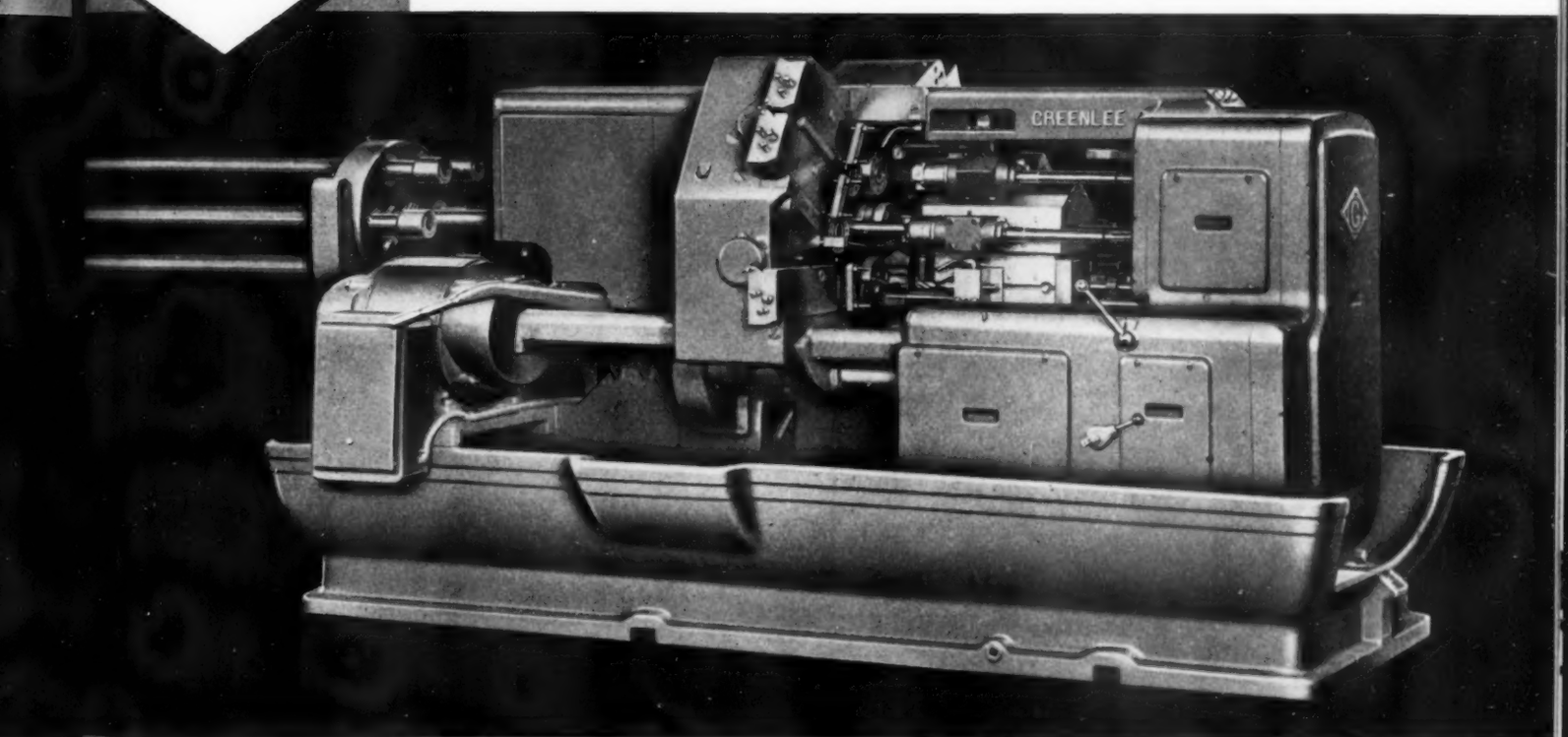
The two machines shown here are typical of the wide variety of special-purpose tools regularly built for such operations as boring, drilling, tapping, reaming and milling. Complete information supplied promptly on request.



AUTOMATIC
SCREW MACHINES
•
MULTIPLE SPINDLE
MACHINES *for* DRILLING
BORING, TAPPING
MILLING, REAMING *and*
SIMILAR OPERATIONS

6-SPINDLE AUTOMATIC

You Get FAST PRODUCTION CONTINUOUS ACCURACY ★ QUICK SET-UP ★ ACCESSIBILITY ★ ★ EASE OF CONTROL



● When you install a Greenlee "Six", you get the latest in six-spindle screw machine design, because it not only incorporates the basic principles of the "Four", but includes others of especial value in six-spindle performance. You get six independent cross slides actuated by interchangeable plate cams; a main tool slide operated by intermittent gearing, not cams; collets that can be removed without indexing the head; and you get many other features, such as built-in set-up lighting and wide-open accessibility. All these features make for easier operation, quicker change-over and higher production. And they all help win the battle for lower manufacturing costs.

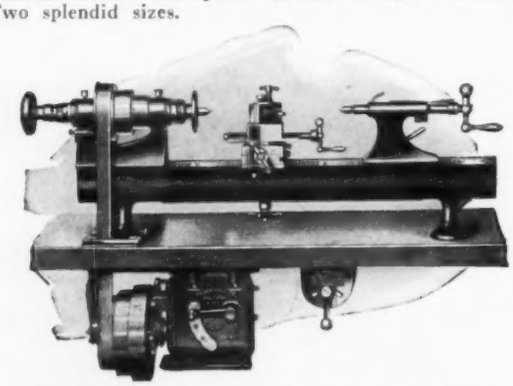
★ Let us send descriptive matter on Greenlee Four and Six-Spindle Screw Machines. And if you have a work piece up for consideration, let us have full information concerning it. A production estimate will be furnished promptly. No obligation, of course.

GREENLEE BROS. & CO., ROCKFORD, ILLINOIS, U. S. A.

"Stark"

The New INTEGRAL DRIVE PRECISION BENCH LATHES (patented)

Built-in drive. No special cabinet or bench necessary. Two splendid sizes.



Stark Precision Bench Lathes • 6 Sizes and Stark Motor Drive Unit—the original and best under-bench drive

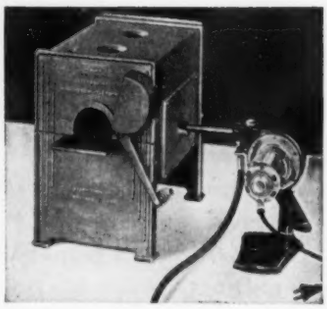
Lever Chuck Closers and **Spring-Bind Heads** for fast and extremely accurate manufacturing; **Automatic Turret Heads; 3-bearing Heads; 5 Spindle Diamond Drills;** Sensitive **Upright Drills, Collets, Chucks.**

STARK Precision Spiral and Plain Bench Millers

The most accurate of their type. Index Centers are the closest of any in this small size.

"ELECTROBLAST" High Speed Muffle Furnace and Portable Torch $70

Torch Only, $30



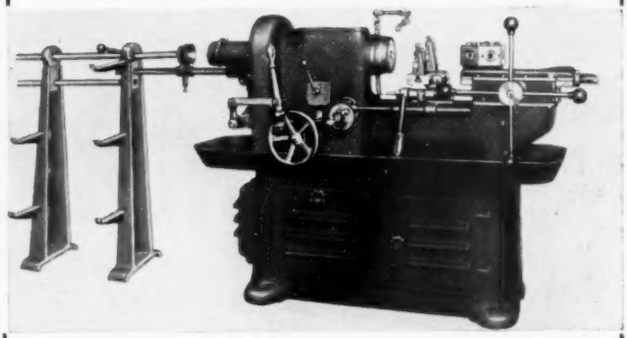
High speed heat in 20 minutes. Operates for 7c per hour. No scaling or decarburizing; quickly saves its cost.

Also, with hydrogen atmosphere for the correct brazing of carbide-tipped tools

STARK TOOL CO. Est. 1862 Waltham, Mass.

Originators of the American Bench Lathe

This *NEW* TURRET LATHE . . .



provides INFINITE Spindle Speeds from 180 to 3600 R.P.M.

1" WIRE FEED CAPACITY

•

6 1-2 TURNING LENGTH

•

MOTOR DRIVE

The *New* **No. 2 TURRET LATHE** is designed for low cost production of small parts from bar stock for second operation as well as chucking work. It offers new features which are the result of twenty-five years machine tool building experience.

Exact spindle speed is obtained instantly and indicated on dial by turning a handwheel. Precision Timken bearings carry the spindle front and rear. Cross slide is provided with stops front and rear, with hand lever for cutting off and forming and with micrometer handwheel for longitudinal adjustment. Turret is mounted on Timken bearings, automatically locked and clamped. Bar feed is of ratchet type with stock revolving on ball bearings. Tools can be furnished to meet special requirements.

Investigate Today—by sending for detailed specifications.

Ask for Bulletin No. 629

MOREY MACHINERY CO., INC.

410 Broome Street **New York, N. Y.**

SHELDON

Back Geared Screw Cutting PRECISION LATHES

SHELDON LATHES, though low in price, are quality machine tools in every detail . . . in design, materials, workmanship and in features.

Made in three sizes (10", 11" or 12" swing) the SHELDON Lathe is just the lathe for your experimental department, repair department or tool room. It is also ideally suited for the manufacturing departments . . . fitted with special tools it is a money maker on second operation work. It can be furnished in many styles and combinations.

Spindles are hardened and ground, inside and out . . . even the spindle nose thread is ground. Quick Change or Semi-quick Change Gear Boxes. Plain Aprons or Worm Feed Aprons with power Cross Feed.

All popular drives.

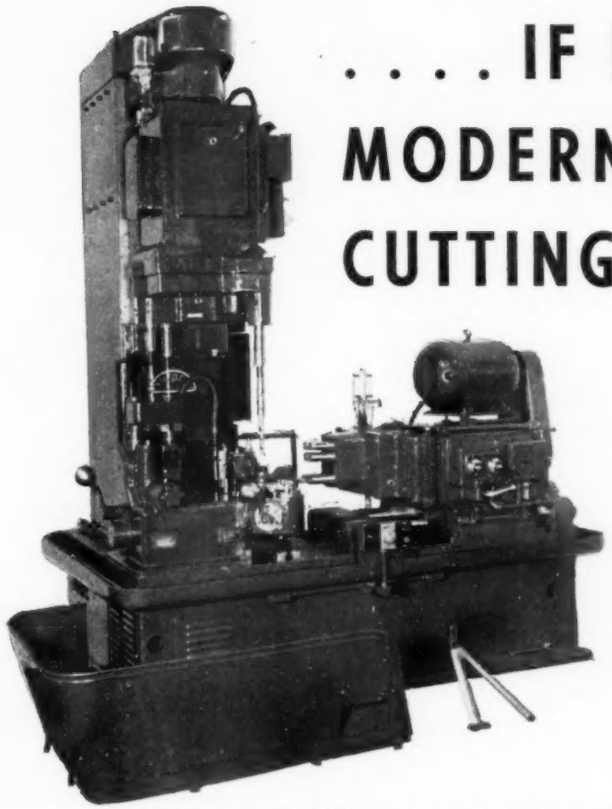
See the SHELDON before you buy

Write for Catalog

SHELDON MACHINE CO.
1635 N. KILBOURN AVENUE
CHICAGO, U. S. A.

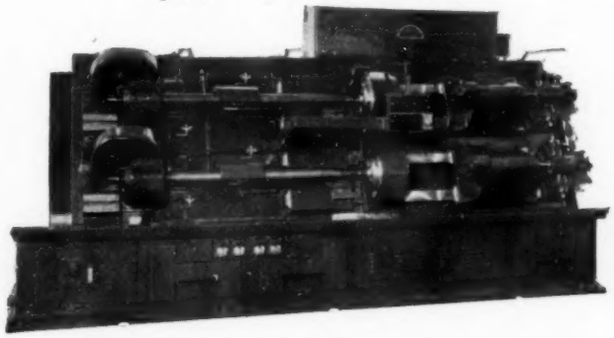
SNYDER HAS THE ANSWER!

. . . . IF IT'S A QUESTION OF MODERNIZING WITH COST-CUTTING SPECIAL MACHINES

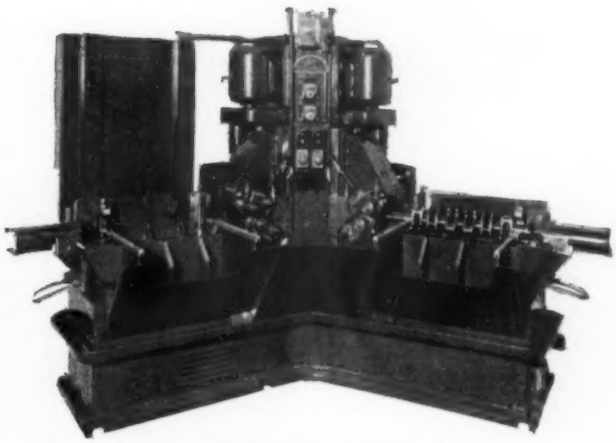


√Check these three examples of the wide variety of special machines now being built by Snyder Tool and Engineering Co.

Want to cut machining costs on relatively small lots? Here's a special drilling machine that is typical of cost-cutting Snyder units being installed in farm implement plants. The 4 extra spindles on the horizontal head and an interchangeable subassembly in the holding fixture permits quick changeover for drilling 3 different parts.



This special Snyder Turning, Facing and Boring Machine cut costs in production of one-piece torque-tube assemblies. All feeds are hydraulic and operation is entirely automatic, while one station is being loaded part is machined in other.



This special Snyder machine mills two keyways in 100 crankshafts per hour. Complete cycle automatic after operator loads part on rail. One station is loaded while work is being milled in other side.

SNYDER TOOL & ENGINEERING CO.

DESIGNERS AND BUILDERS OF SPECIAL MACHINERY

3400 E. LAFAYETTE ST. DETROIT, MICH., U. S. A.

MODERNIZE

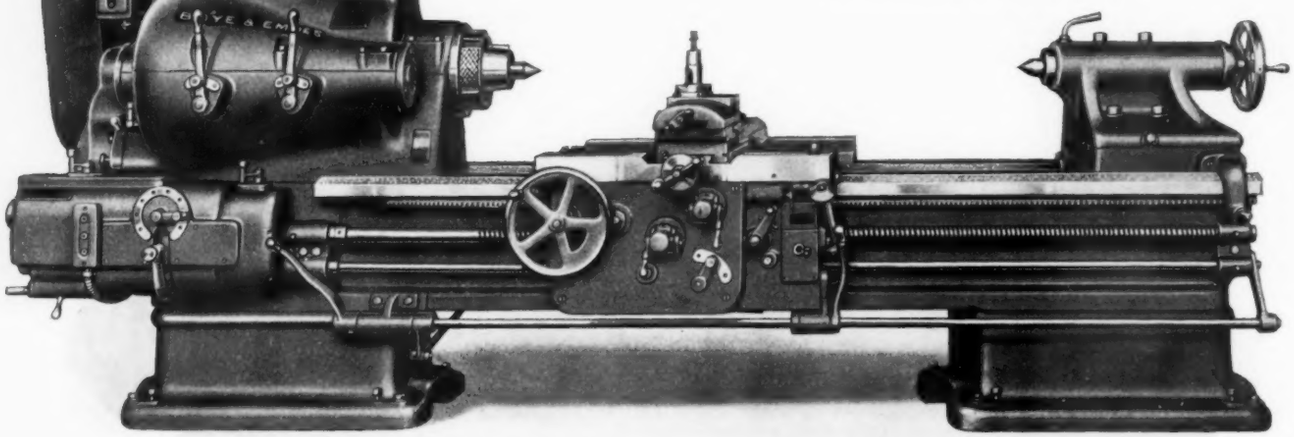
with the LATHES that give you maintained accuracy in heavy duty service

With these sturdy, rugged, modern tools in your lathe department, you can take heavier cuts at faster speeds and be assured of precision work, because Boye & Emmes Lathes are designed in every detail for accuracy under heavy duty demands.

Back gears are mounted in front of spindle and are used for eight of the twelve speeds when taking heavier cuts. By mounting in this position, a downward rotating pressure is exerted on the spindle, rather than an upward pressure, with the result that the upward lift of the cutting tool is counteracted and balanced.

Other features of outstanding importance in maintaining precision and in achieving operating convenience and long life are fully described in engineering bulletins available free on request. If you are interested in modernizing your heavy duty turning operations, investigate Boye & Emmes specifications carefully.

BOYE & EMMES MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.



VITRIFIED

Keep production on its toes by standardizing on . . .

VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Vitrified Wheels

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiency on Vitrified Carborite Wheels.

. . . For accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . Also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

VITRIFIED WHEEL CO.
WESTFIELD MASS.

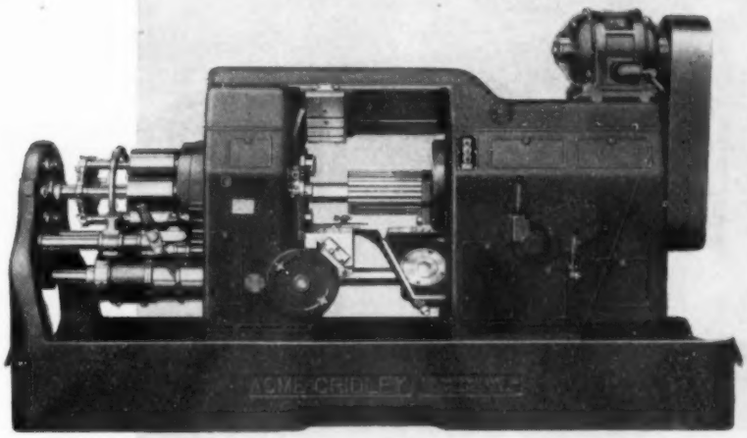
OUTMODED MACHINES never travel the main highways of profit. Even when business is flush, they retard production schedules. Eventually they dead-end in no profit operation.

But, obsolescence is always relative. The question is: how much faster, how much more accurate, versatile and convenient are the new Model RA Acme-Gridleys than the methods you are now using for your bar cut parts?

To make that comparison, start with the Acme-Gridley cost-determining formula at your right. It is basic and important.

No matter whether your requirements are in the class of massive diesel engine sleeves or tiny parts for meters, it will pay you to find out whether the new Acme-Gridleys will boost your production 30%, 50% or more than 100%.

Don't wait until business gets tough; don't sacrifice your parts profit to meet competition, when you can *insure* for years ahead with these modern multiple spindle automatics. Ask our production engineers to figure with you.



4-6 & 8 SPINDLE AUTOMATICS

guarantee sustained accuracy at the fastest feeds and highest spindle speeds that modern cutting tools can safely stand.

Acme-Gridley

NATIONAL ACME

170 EAST 131ST STREET • CLEVELAND, O.

ME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • SELF OPENING DIES
COLLAPSING TAPS • THE CHRONOLOG • POSITIVE CENTRIFUGE • SCREW MACHINE PRODUCTS • CONTRACT MANUFACTURING

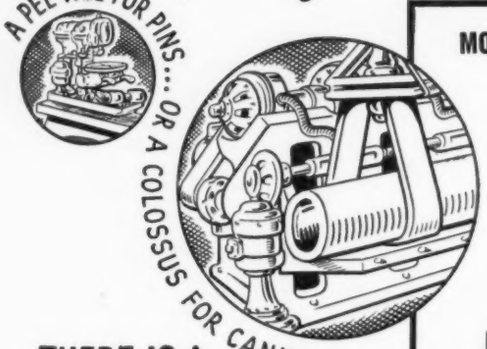
ALLEN TRU-GROUND DOWEL PINS

CALLED Dowel Pins, commonly thought of only for use in punch and die work, —*think further* of your possible uses for these Tru-Ground shafts of Allenoy steel in 38 lengths: 3/8" to 6" and 11 diameters: 1/8" to 1". Tensile strength 240,000 to 250,000 lbs. per square inch.

Metallurgically in the class of Allen Hollow Screws, heat-treated with the same scientific control; ground to exceedingly close tolerance limits. Ask for size and price-sheet, with *samples.*

THE ALLEN MFG. COMPANY
HARTFORD, CONN. U. S. A.

What's your problem?



THERE IS A RUTHMAN **GUSHER** COOLANT PUMP TO FIT YOUR DESIGN

Ruthman engineers are available to help you solve your coolant problems. Give us the facts. We'll do the rest.

THE RUTHMAN MACHINERY CO.
201 PIKE ST., CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

MODERNIZE THE EASY WAY WITH RUTHMAN GUSHERS

All Gusher models are precision-built, ball-bearing, quiet, self-cleaning and hydrostatically balanced.

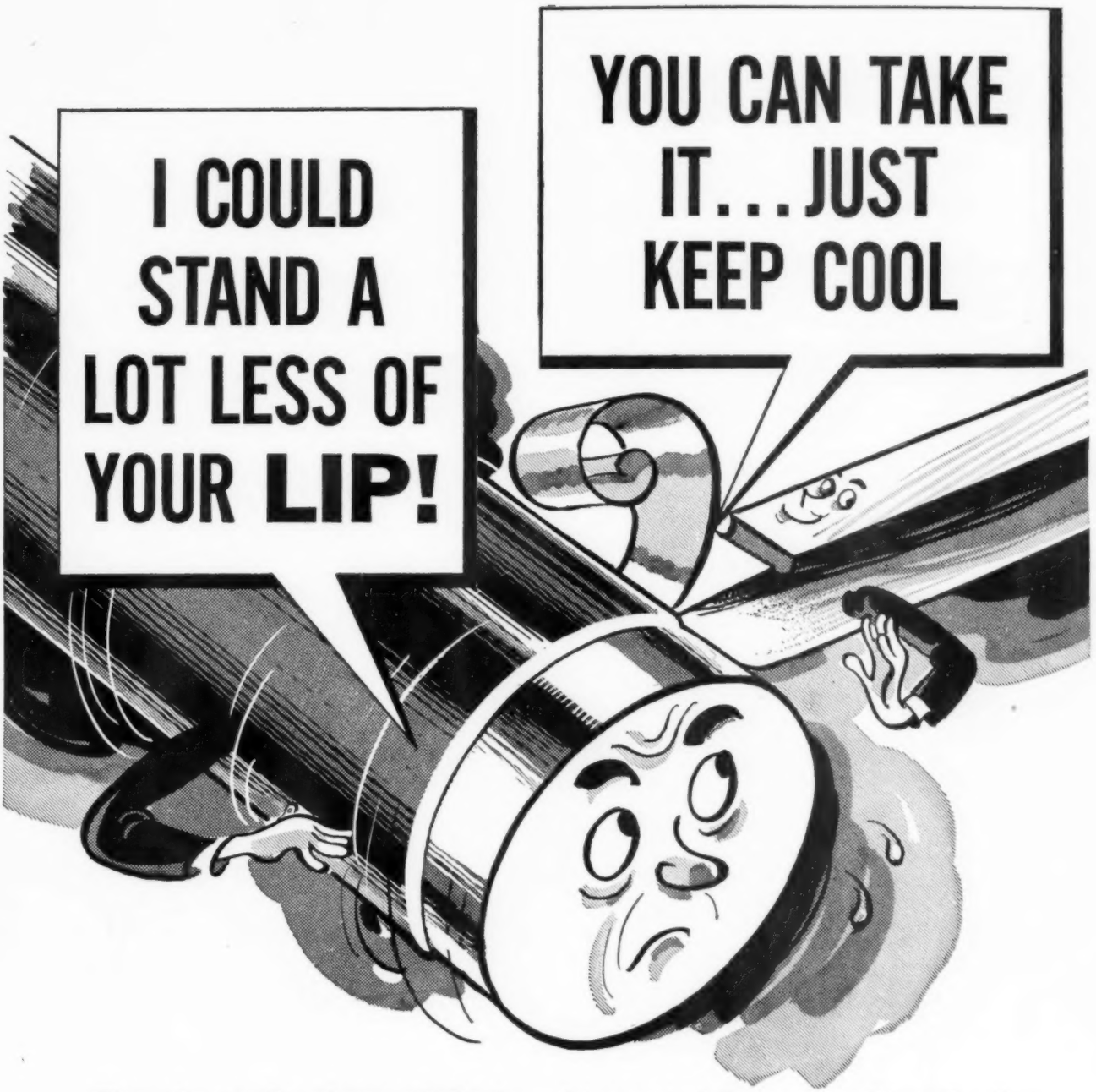
What are your Pump Requirements?

-Tell us your needs!

- We can furnish **Stock Pumps** in a wide variety of types and sizes—Geared - Vane - Centrifugal.
- Also—**Special Pumps** made to your order.

Write—Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

BROWN & SHARPE PUMPS
B·S



There has to be plenty of slip between the chip and the lip—on all your machine tools.

The heat generated by that metal-to-metal contact is constant and can be damaging. And the surest way to keep this heat under control is to use the correct cutting oil for each metal you're working.

For smooth finish, long tool life and satisfactory production, you need a cutting oil exactly suited to the type of operation and to the metal being worked. For every condition, the oil must be properly "balanced."

The right balance between cooling and lubricating, in machine work of many kinds, with metals of many kinds, is learned only by experience. By the practical experience that is gained by working in the shops of men with problems like yours. Shell men have been doing that for years.

That's how Shell has been able to make cutting oils that speed production and cut costs.

SHELL

SHELL INDUSTRIAL LUBRICANTS

CARBORUNDUM *announces*

2 series of VASTLY IMPROVED RESINOID BONDED WHEELS

WE refer to the improved types of resinoid bonded wheels just developed for foundry grinding practice—the "K" series bonding Aloxite Brand Aluminum Oxide—the "C" series bonding Carborundum Brand Silicon Carbide.

These successful wheels are the products of two fields of investigation and research.

First came the exhaustive field study of industry's requirements—a study made in the light of changed grinding equipment—new and improved methods in the application of abrasives—new grinding conditions resulting from metallurgical progress.

Then these field investigations were correlated with the result of our own research and these new bonds—new types of wheel structures and new processes of wheel fabrication resulted.

These combined facilities have brought to the foundry industry vastly improved resinoid bonded wheels in a range of cutting action to meet every foundry grinding need—from the fastest cutting wheels to the wheels of longest life.

New standards of grinding wheel efficiency have been established to bring about the proper balance between your labor and abrasive costs—to reduce your overall grinding costs.

These new types of wheels are being successfully applied to general foundry grinding, to billet grinding and to miscellaneous work on stand and portable grinders.

You pour it—and we'll grind it.

CARBORUNDUM
ABRASIVE PRODUCTS

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

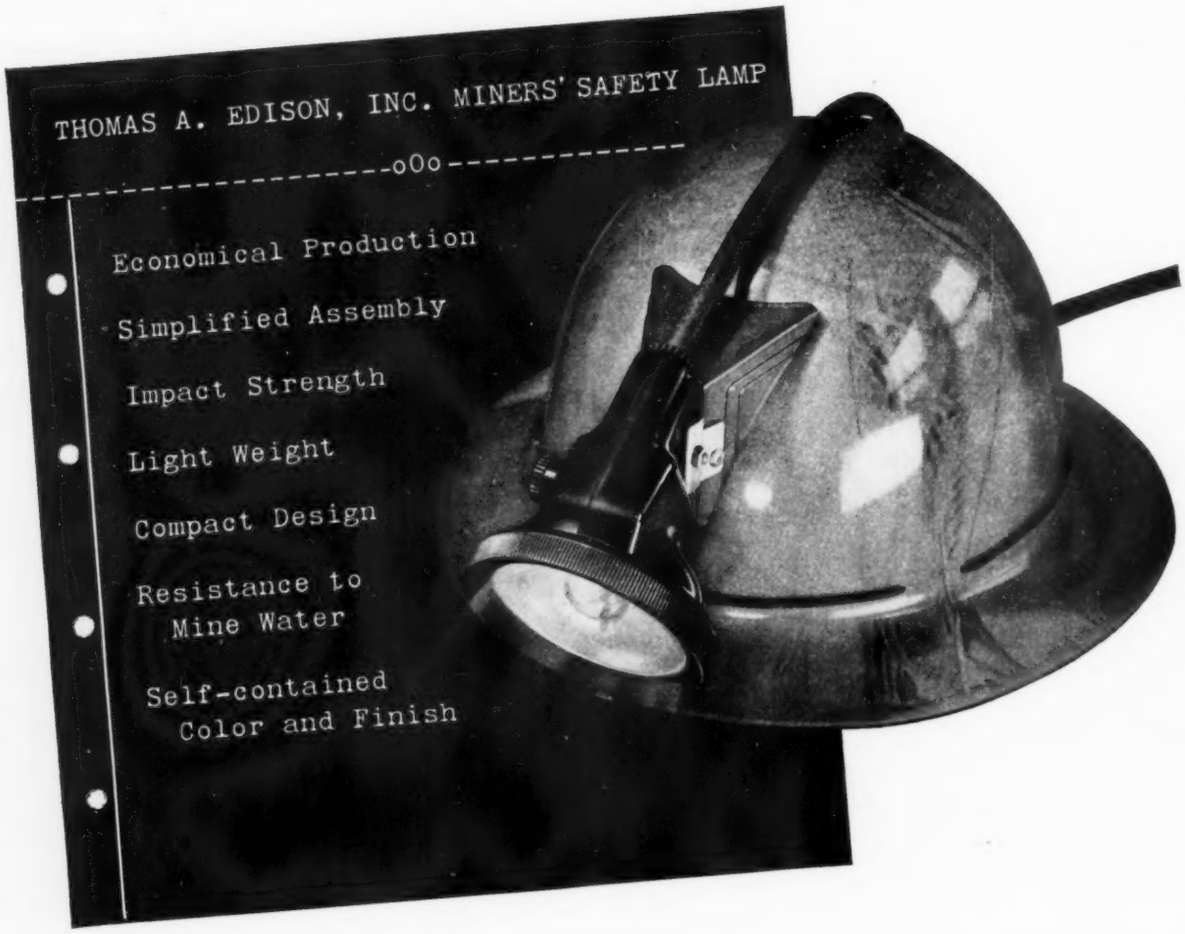
REG. U. S. PAT. OFF.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company)

BY MODERNIZING WITH BAKELITE PLASTICS

Edison Decreased Costs—Increased Efficiency of this Miners' Safety Lamp



BY MODERNIZING their products with Bakelite Plastics, a growing number of manufacturers have gained innumerable benefits which these versatile materials make possible. Outstanding among the benefits afforded Thomas A. Edison, Inc. for instance, are lowered costs and simplified production of its Miners' Cap Lamp.

Economically produced of molded Bakelite Plastics in just three pieces . . . body, bezel ring and switch knob . . . the housing for this safety lamp is ready for speedy, accurate assembly as soon as it leaves the molding press. Threads, knurled edges, embossed lettering and other details are all formed in one operation. Rich luster and color, being self-contained, eliminate costly finishing operations.

Although the Bakelite Plastic housing withstands the severe impact shocks of underground service it is, nevertheless, light in weight. Furthermore, neither its appearance nor performance is affected by daily contact with mine water.

Another striking example of the manufacturing economy and efficiency of Bakelite Plastics is the Mine Safety Appliances Company's Skullgard. Designed for use with the Edison Miners' Lamp, it also is formed in one simple operation . . . from Bakelite Laminated. Less than ⅛" thick, and weighing under 16 ounces, this modernized safety helmet is sufficiently strong to protect workers from crashing rocks and debris.

You can readily determine how Bakelite Plastics can modernize *your* products and production methods by writing for illustrated booklet 2P, "New Paths to Profits".

BAKELITE CORPORATION, 247 PARK AVE., NEW YORK

Unit of Union Carbide and Carbon Corporation

UCC

BAKELITE

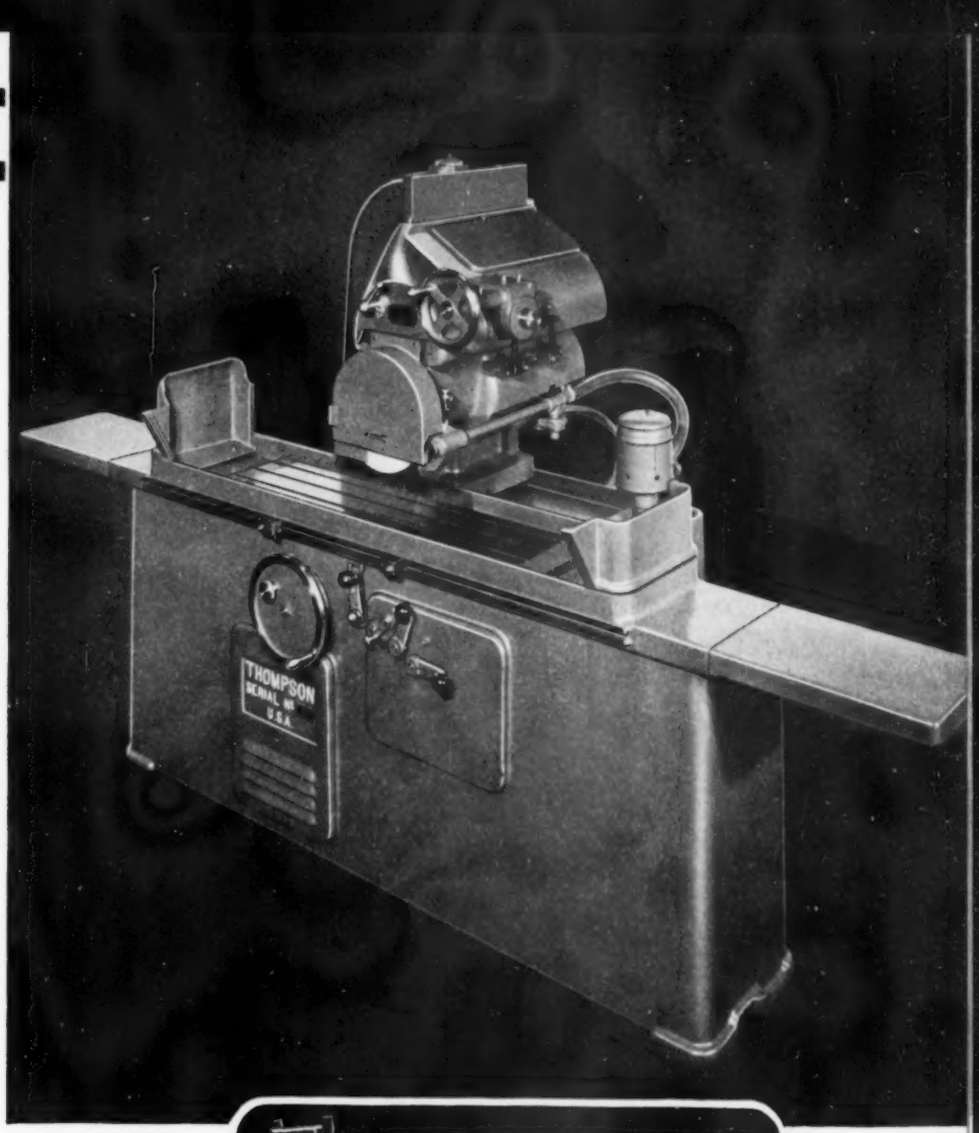
PLASTICS HEADQUARTERS

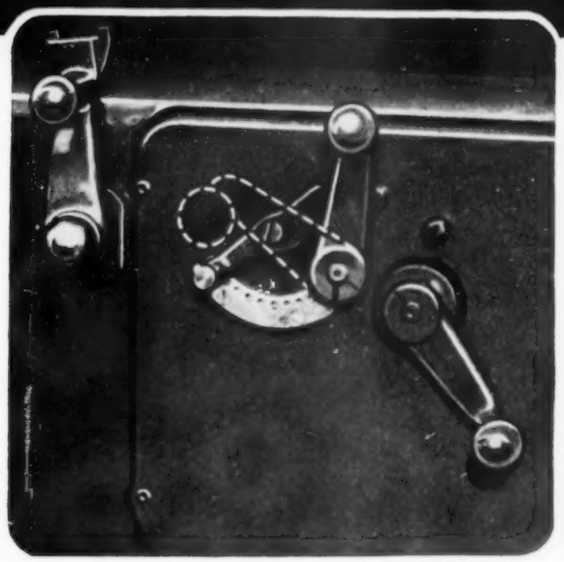
HYDRAULIC
Rapid Wheel Head
TRAVERSE
is an Exclusive
THOMPSON PATENT

—an important Thompson feature which provides the distinct advantage of conveniently placing the wheel head to and from the work, and greatly simplifies automatic wheel truing. The cross feed lever, shown at the left in the insert, actuates this hydraulic unit. Note also that this centralized control panel permits operators with limited experience to use the Thompson Grinder with marked success. It is the accumulation of a number of valuable features—many exclusive with Thompson—which makes these Grinders productive and profitable.

The new Thompson Bulletin No. 9 describes these features in detail. Send for a copy, if you want information on the most modern Grinder innovations.

THOMPSON HYDRAULIC RAPID TRAVERSE





THOMPSON SURFACE GRINDER

9" x 12" x 40"

OTHERS AVAILABLE IN 46 SIZES
FROM 18" to 168" LENGTH

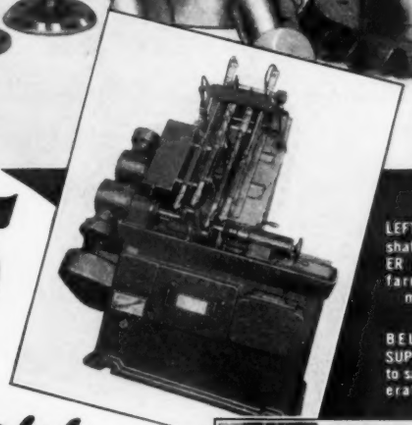
VIBRATIONLESS HYDRAULIC POWER • WHEEL HEAD SLIDE WIPERS • HYDRAULIC RAPID TRAVERSE • GENEROUS COLUMN WAYS • POWER ELEVATION • TELESCOPE PIPING • PATENTED CONTROLS • ANTI-FRICTION ELEVATING NUT • VIBRATIONLESS WHEEL HEAD • ALLOY STEEL, HEAT TREATED SPINDLE • RIGID MACHINE BEDS • AUTOMATIC WHEEL TRUING • AUTOMATIC DOWN FEED • AUTOMATIC SPARK-OUT

THE THOMPSON GRINDER COMPANY, Springfield, Ohio, U. S. A.

FOR LOW COST PRODUCTION OF BETTER SURFACE FINISHES

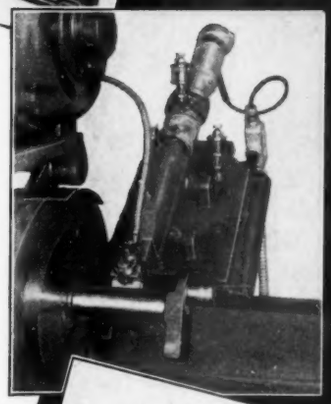
2 TO 4 MICRO INCHES

FOSTER *Superfinishers*



LEFT—Foster crankshaft SUPERFINISHER used by leading farm implement manufacturers.

BELOW—Foster SUPERFINISHER used to superfinish refrigerator crankshafts.



NOW USED BY MANY MANUFACTURERS

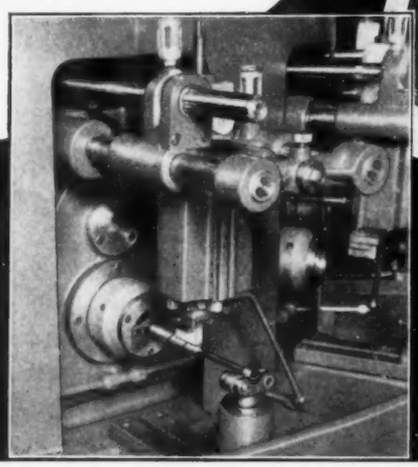
Because there is a universal and constant demand for better products at lower manufacturing costs, SUPERFINISHING is being eagerly adopted in industry after industry. *Superfinishing,* for the first time, provides a mechanical method of obtaining better finishes in less time and at lower cost. It removes surface defects, creates a practically perfect bearing surface and greatly increases life of part.

Foster pioneered in the developing of *Superfinishing* equipment. Foster *Superfinishers* have been tested and proved in a wide range of industries. Our experience is at your service. Inquiries with part prints and/or sample parts will have immediate attention.

FOSTER MACHINE CO., 501 FOSTER BLDG., ELKHART, IND.

ABOVE—Foster SUPERFINISHER in Aviation plant, finishing propeller hubs.

Foster SUPERFINISHER at work on faces of automotive pressure plates.



LEFT—Superfinishing automotive distributor shafts with Foster 12 spindle SUPERFINISHER.

■ To W-S hydraulic machines—such as this powerful press built for a "key" aircraft plant—are entrusted many highly important jobs in the nation's vital industries.

W-S fits each machine to its intended task . . . including faster operation, with accuracy and positive control at top speed. *Plus* endurance.

Experience here is essential . . . W-S for 85 years has designed and built hydraulic machinery of all types. W-S presses serve a score of industrial uses besides the extrusion molding, flanging, bending, straightening and forming operations handled by the presses illustrated.

The W-S engineers may have the answer to that hydraulic question of yours. Ask them.

THE WATSON-STILLMAN COMPANY • ROSELLE, NEW JERSEY

WATSON-STILLMAN

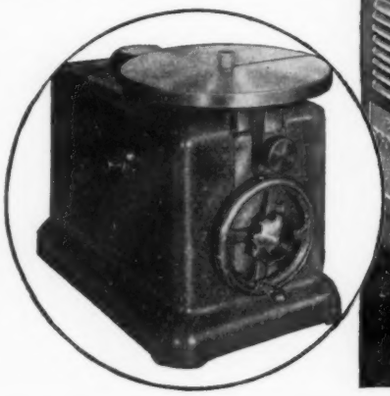
Grinding and Fitting Contours in Die Making

Old Method
HOURS in TIME
$ $ $ $ in COST

Old Methods always worked because only mechanics who were expert at fitting dies and punches were permitted to do such difficult and exacting tasks. Long, tedious hours were consumed in filing and hand-stoning odd shaped contours to proper fit. That is why costs were always so high.

New Method
MINUTES in TIME
¢¢¢¢ in COST

BOYAR - SCHULTZ Profile Grinders point the way to the New Method of fitting dies and punches as well as templates, cams and other uneven surfaces and difficult contours. These and other similar task can be completed in minutes instead of hours. And the resulting savings are not the only advantage . . . a better job done can always be expected.



Hundreds of Tool and Die Shops and Toolrooms throughout the country and abroad have discovered the excellent work and savings possibilities in BOYAR-SCHULTZ Profile Grinders.

Available in Portable Bench Model and in the Large Floor Model for larger and heavier work.

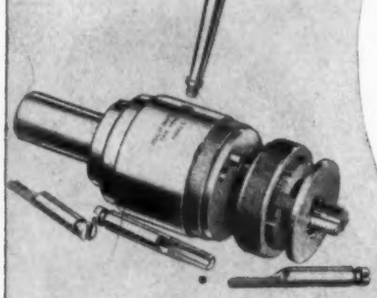
Write For Detailed Information

BOYAR-SCHULTZ CORPORATION

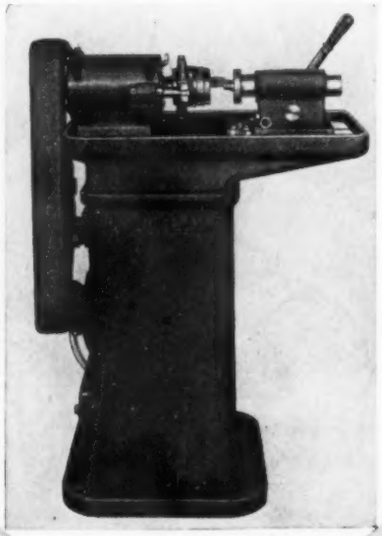
2109 Walnut Street **Chicago, Illinois**

MORE PIECES *Threaded or Tapped* PER DOLLAR

Low first cost—4 sq. ft. of floor space—¾ H. P. Motor —3 speeds—Oil Pump and Reservoir — special Work Holder — Automatic Die Head or Tap shown below carried on ball bearing spindle, yoke control actuated by operating handle — in short, the greatest value in threading machines we have produced and we have built thousands. Send in parts up to ¾" for production threading estimates—state capacity needed.



R-S Model "C" Collapsible Tap for either live or stationary spindle work



R-S Revolving Type Yoke Controlled Die Head

RICKERT SHAFER CO.

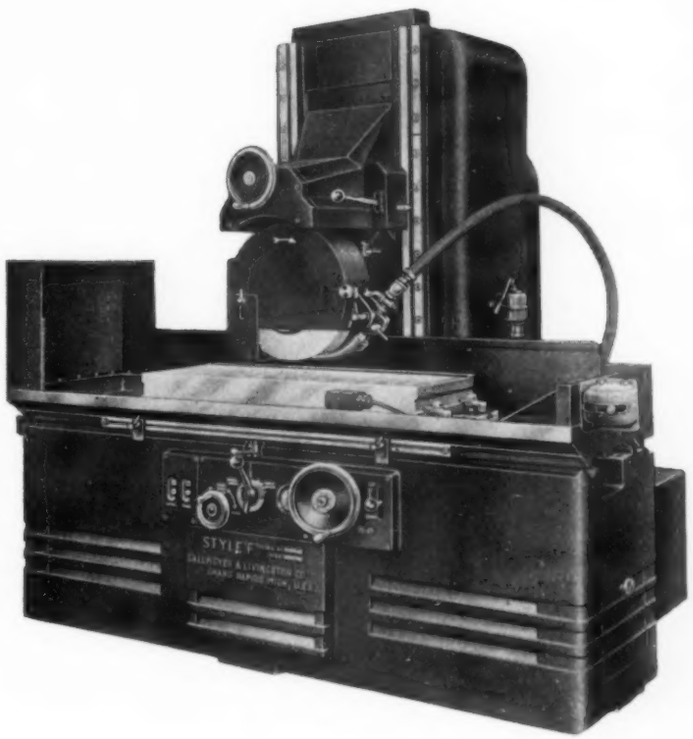
633 WEST 11TH STREET, ERIE, PA., U. S. A.

GRAND RAPIDS MODEL F

—HIGH SPEED PRODUCTION TYPE—

HYDRAULIC FEED SURFACE GRINDER

...designed especially for modern shops demanding maximum productive capacity with extreme accuracy



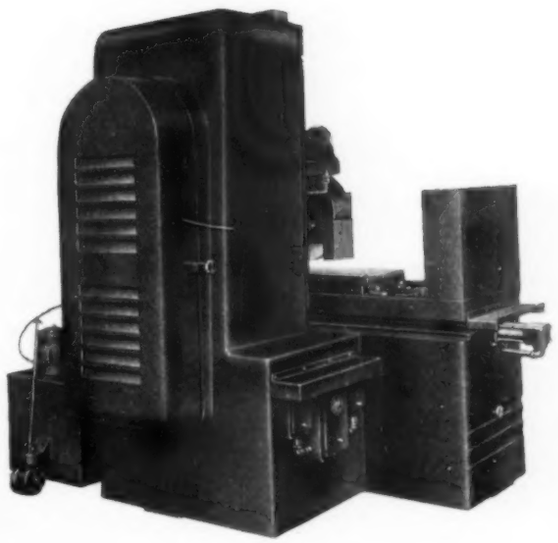
● This Grand Rapids Surface Grinder is the culmination of more than thirty-five years experience in the design and manufacture of fine, precision grinding machines, an outstanding development of the Cross Traveling Head Type Surface Grinder—modern—rugged—long-lived—extremely accurate—fast—convenient.

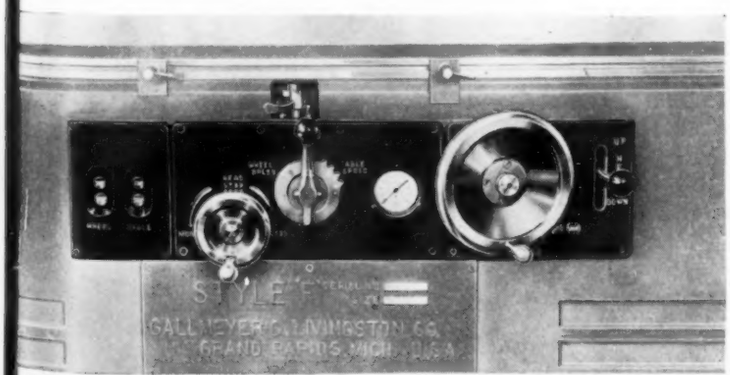
It is remarkably smooth and quiet in operation at all speeds up to its maximum longitudinal table speed of 150 feet per minute.

A dynamically balanced motor drives spindle through splined end so as to relieve the cross traveling mechanism of carrying the weight of the motor.

Location of the grinding wheel spindle between the vertical ways with the vertical screw placed directly below the weight it carries eliminates any tendency toward a bureau drawer or cramping action in the vertical movement.

These and other outstanding features are fully described and illustrated in Bulletin No. GL 108. Send for a copy. Ask our engineers to show you how you can modernize your surface grinding operations with Grand Rapids Machines.





Finger Tip Control, conveniently located, provides easy operation and contributes to high productive capacity.

Heavy, rugged, one-piece column permits accessibility of working parts through swinging door.

GALLMEYER & LIVINGSTON CO

330 STRAIGHT AVE. S.W.

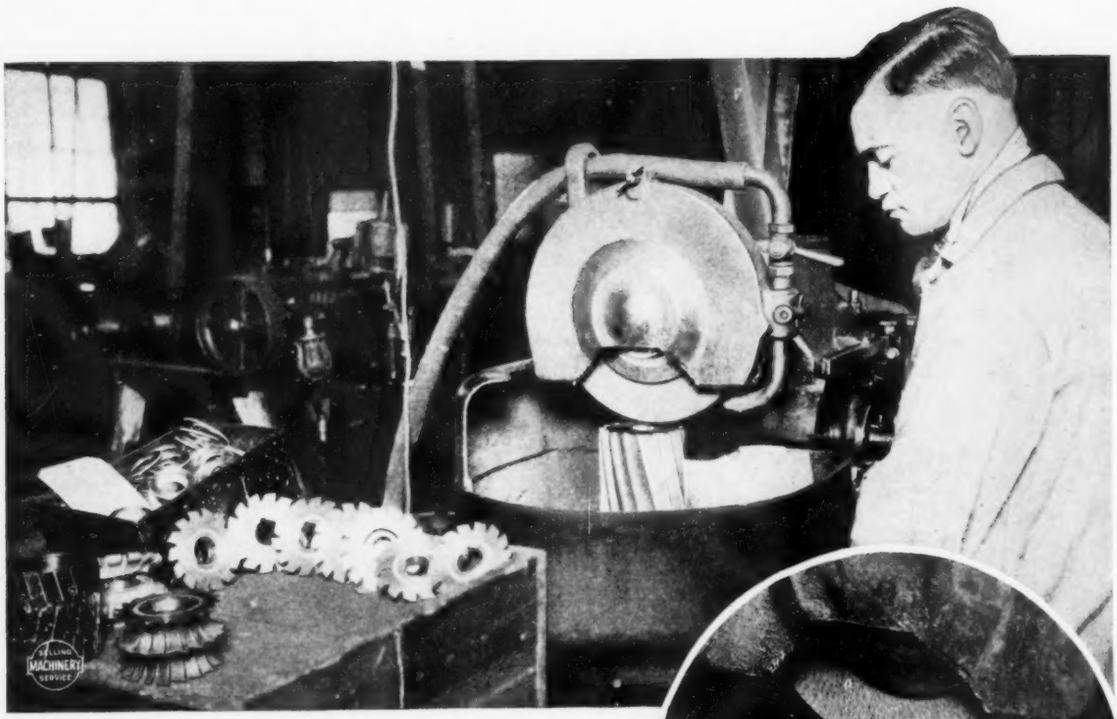
GRAND RAPIDS, MICHIGAN

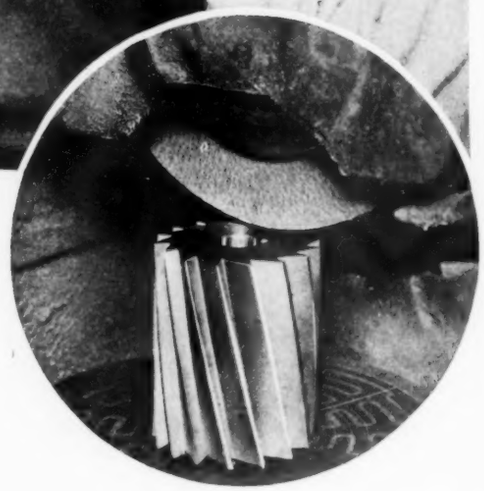
ARTER

Rotary

Surface

Grinders



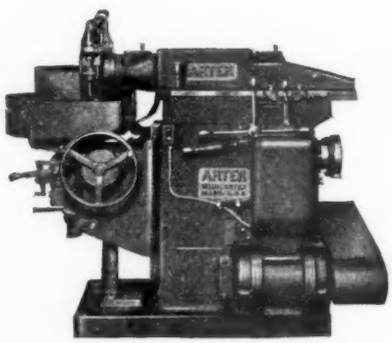


Production with Precision on Tool Room Work

The pace and quality of present day production makes demands on grinding speed as well as accuracy. Arter Grinders give you good measure in both.

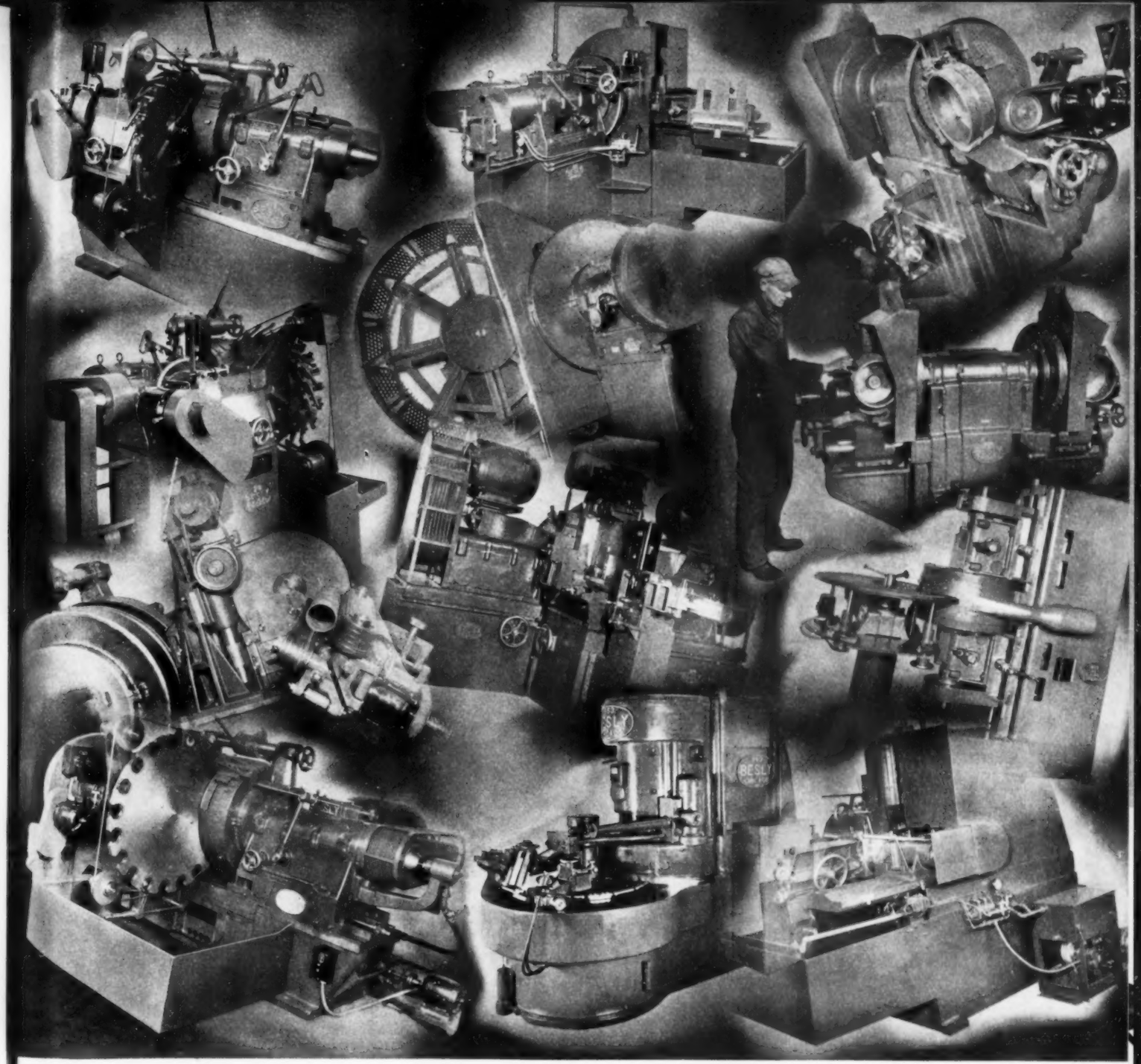
Be it tool room work or shop production, the flexibility of Arter Grinders merits consideration.

Great Vertical capacity, a tiltable work table and a powerful magnetic chuck are noteworthy features.



Model A grinders shown above are mechanically operated and made in three sizes 8"-12"-16". Other models have capacities up to 40".

ARTER GRINDING MACHINE CO.
WORCESTER **MASS.**



Watch the Besly Parade!

MARCHING out of the Besly Engineering Department a veritable parade of Automatic and Semi-Automatic Machines.

Above we show just a few of the many special purpose Besly Grinders that are daily lowering costs—producing more accurate surfaces and improving finish. Let us tell you what the Besly Grinder and the Famous Besly Titan Steelbac Abrasive Wheel can do for you.

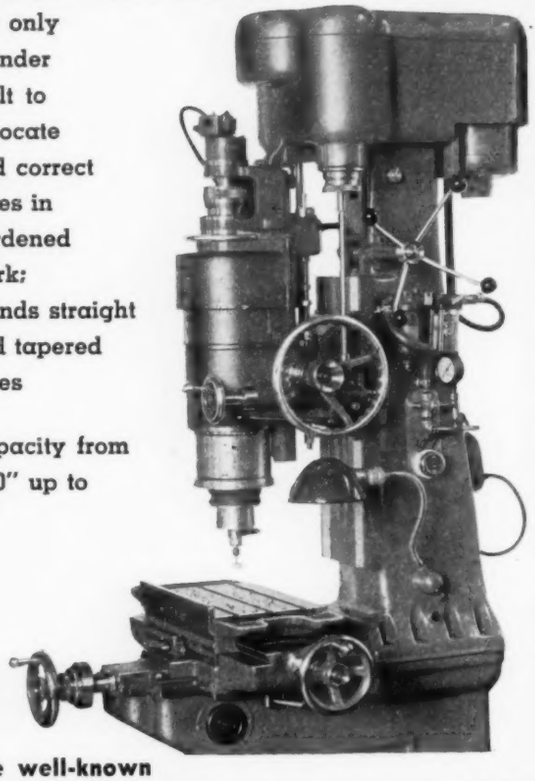
CHARLES H. BESLY AND COMPANY

118-124 NORTH CLINTON STREET ★ CHICAGO, ILLINOIS

NEW—The MOORE JIG GRINDER

the only Grinder built to re-locate and correct holes in hardened work: Grinds straight and tapered holes

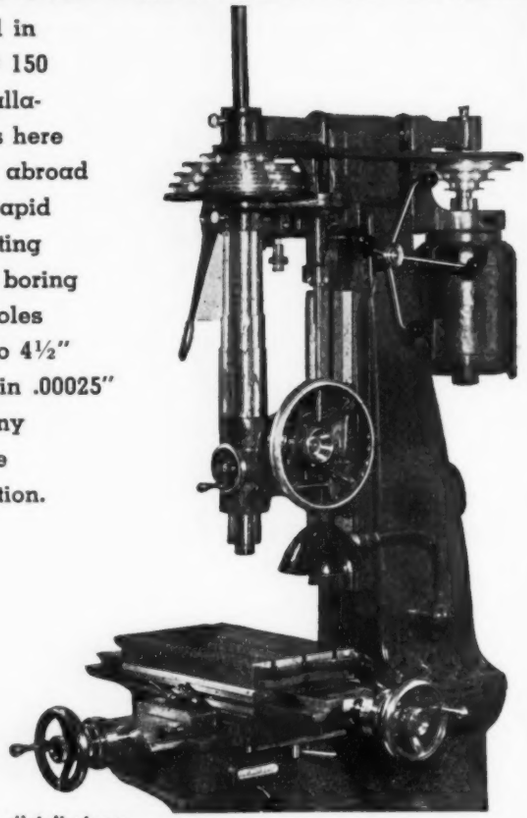
Capacity from .030" up to 4"



The well-known

MOORE PRECISION JIG BORER

used in over 150 installations here and abroad for rapid locating and boring of holes up to 4½" within .00025" in any table position.



Sole distributors:—

MARBURG BROS., INC.

90 West St. NEW YORK

Save up to 65% on FINISHING and PLANE SURFACING OPERATIONS

New PORTER-CABLE SANDER GRINDER

Pays for Itself Quickly

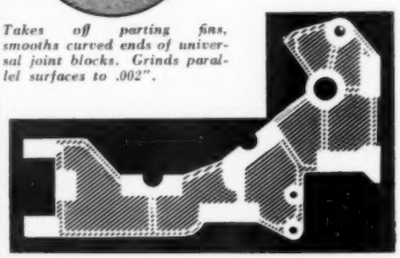
He's the wise production man who sees for himself—right now—how this modern, speedy, cost-cutting, quality - improving belt sander - grinder puts antiquated methods in the discard. Porter-Cable Sander-Grinder frequently takes the place of wheel and disc grinding, and in numerous cases makes milling unnecessary. Works to surprisingly close limits—built to maintain full output all day, every day. Does either dry or wet grinding and gets equally good results on steel, brass, aluminum, stainless, marble, plastics, tile.

New Porter-Cable "G-8" Features:

106 in. belt • Easy tension and tracking adjustment • Safety enclosure • Sealed ball bearings • Large shafts and pulleys • Attachments for wet grinding.

Maybe some of *your* production operations can be done this time-saving, cost-cutting way. Without obligation, send sample castings, and plastic pieces, for our engineers' suggestions.

Takes off parting fins, smooths curved ends of universal joint blocks. Grinds parallel surfaces to .002".



One Operation faces 12 bosses per side and produces parallel surfaces to .005 inch!

Replaces disc grinder on die-casting for squaring parallel edges to .005" tolerance, providing slip fit.

PORTER-CABLE MACHINE CO.

1725-E NO. SALINA ST., SYRACUSE, N. Y.

WHEN YOU MODERNIZE

GET THE

PROFIT ADVANTAGES

OF A

KNIGHT MILLER

KNIGHT VERSATILE MILLERS ACCURATE - RIGID

★ Some of the profit advantages you get when you modernize with a Knight Miller are (1) the utmost efficiency and savings on the widest possible range of work (2) a minimum amount of investment in special equipment and tools (3) and with the Universal Table construction, a big saving in set-up time.

All features of the Knight Miller—accuracy, rigidity, power, flexibility—are equally developed to the highest degree.

The above picture shows one example of the careful and accurate work that can be done with a Knight Miller. The operator is boring a 3" hole 1½" deep in a piercing die in the plant of the Oliver Farm Equipment Co.

● Having power and rigidity for heavy cuts, speed, and accuracy for light milling and boring, and with versatile features enabling quick changes from one job to another—Knight Millers are real profit makers.

Be sure you know all of the Knight Miller benefits—write and get all of the facts.

INVESTIGATE THE

KNIGHT MILLER

DESCRIPTIVE FOLDER SENT ON REQUEST

W. B. KNIGHT MACHINERY CO.

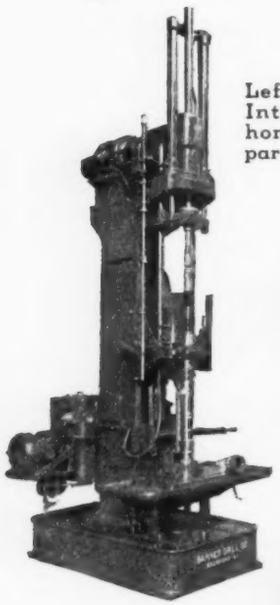
• ST. LOUIS, MISSOURI •

for Precision Production Economy

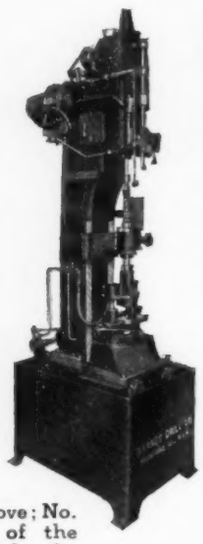
BARNESDRIL

Honing Machines
Drilling Machines

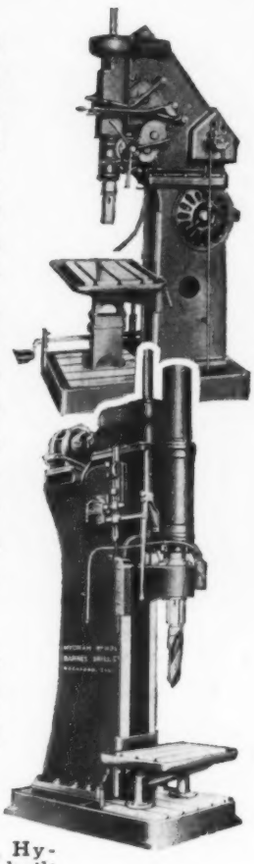
Industry speeds up! In thousands of plants throughout the industrial world BARNESDRIL Honing Machines and Drilling Machines daily demonstrate precision, production and economy. BARNESDRIL Hydraulic Honing Machines for internal and external work provide the most rapid, accurate means for finishing cylindrical surfaces to final size. BARNESDRIL Self-Oiling, All-Geared and Hydram Hydraulic Drilling Machines are noted for accuracy and productive capacity. Write, today, for literature and name of nearest BARNESDRIL representative . . . or visit our plant to see at first-hand how BARNESDRIL high quality, utility and value are created.



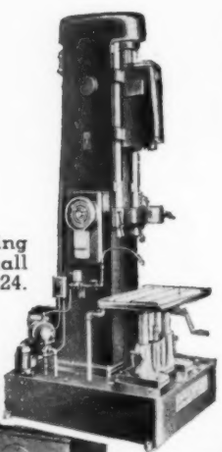
Left, No. 306-H Internal Honer, honing airplane parts.



Right, above; No. 172, one of the smaller Hydraulic Internal Honers.

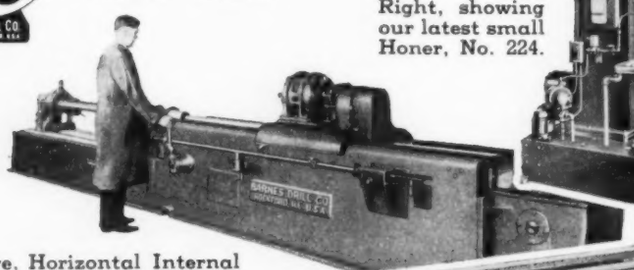


Right, above; typical of Nos. 201¼, 221½ and 242 Self-Oiling, All-Geared Drillers.

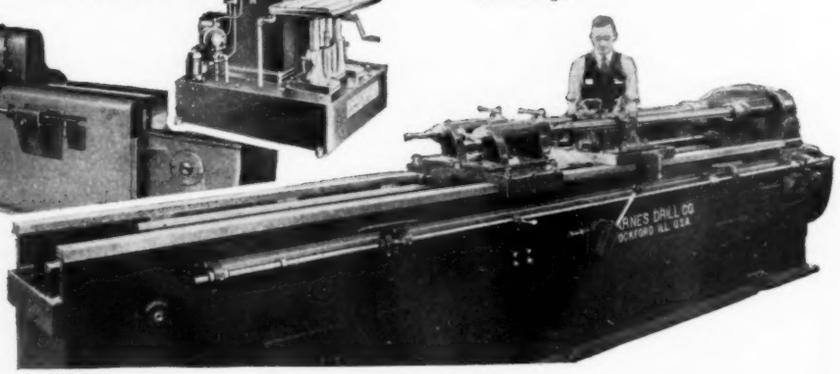


Right, showing our latest small Honer, No. 224.

At right, Hydrams are built in 3 sizes for heavy-duty drilling.



Above, Horizontal Internal Honer; available in many larger sizes and lengths.



Right, External Honing and Lapping Machine with duplex lapping heads.

Barnes Drill Co. 830 CHESTNUT STREET ROCKFORD ILLINOIS, U. S. A.

Again-YEARS AHEAD!

HASKINS

Inexpensive post type fixture with spring kick-out simplifies the handling of these parts tapped on a new Haskins 3-C Tapper. Material is X-1112 high sulphur steel. Hole is tapped 5/16" — 24, ½" deep.

OPERATOR MERELY LOADS THE PART

ACTUAL OPERATION OF TYPE C TAPPER AUTOMATICALLY AIR CONTROLLED!

THREE EASY ADJUSTMENTS to fit the job—the down stroke, the return stroke, the dwell at top of stroke. Then so long as the foot pedal is kept depressed, the Haskins Type C continues its tapping cycles — always with the same *cushioned* pressure. Once set up for a job, it will produce *uniform* results—exactly the same at 4 P.M. as at 8 A.M. So sensitive is the tap head action that if a tap dulls or loads, the machine refuses to work. Tap breakage is tremendously reduced! The operator *can't* make mistakes! *Every* part is precision tapped to tolerances that meet the most exacting requirements.

WRITE FOR BOOKLET

If you want real precision at high speed, if you want absolute uniformity of work, less tap breakage and lower costs per job, you want the Haskins Type C Tapper. If you want a machine that can be quickly converted to use automatic, air operated magazine-feed and dial-feed fixtures, for high production schedules, you want the Haskins Type C. New booklet gives complete details covering the three capacities in which Type C is available. Copy gladly mailed on request. Write today. R. G. Haskins Company, 2760 W. Flournoy St., Chicago.

AIR Control

HASKINS

Precision

TAPPING EQUIPMENT

THE GOOD OLD DAYS - - - WON'T DO TODAY

DRILLING

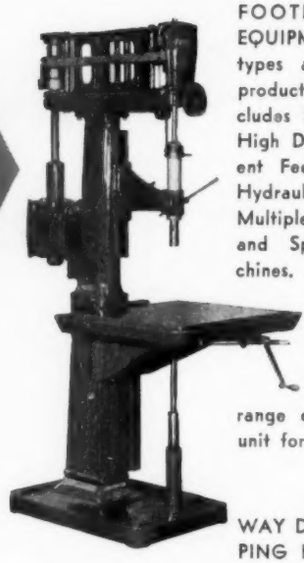
FOOTBURT
makes profitable modernization possible...

Many of the most outstanding improvements in drilling, boring, tapping and surface broaching operations have been pioneered by FOOTBURT.

These improvements and the engineering behind them make it highly unprofitable to continue to use obsolete equipment and out-dated methods.

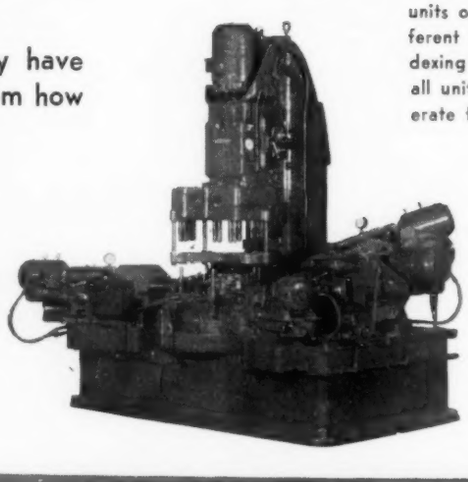
Leading shops in the metal working industry have given FOOTBURT an opportunity to show them how they can produce parts faster, more accurately and at lower cost with modern FOOTBURT machines and have accepted FOOTBURT recommendations for modernizing their production.

FOOTBURT engineers will gladly assist you in determining practical ways and means to make your modernization program pay for itself.



FOOTBURT DRILLING EQUIPMENT is available in types and sizes for every production demand and includes Sipp Sensitive Drills, High Duty Drills, Independent Feed Drills, Cam and Hydraulic Feed Single and Multiple Spindle Way Drills and Special Drilling Machines.

Sensitive Drilling Machine — a full range drill with back gear unit for slow speeds.

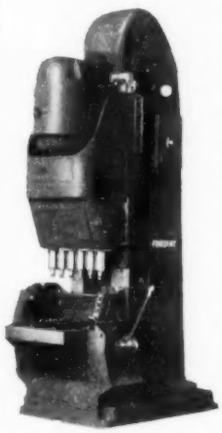


WAY DRILLING AND TAPPING MACHINE. . . . Six units operating from six different angles. Automatic indexing table with table and all units synchronized to operate from one push button.

FOOTBURT

BORING

FOOTBURT Boring Machines are used wherever fine precision and fast production are required. These units are available in Hydraulic or Mechanical Stub and Piloted Bar Cylinder Boring Units, Way Boring Machines and Special Boring Machines.



Cylinder Boring Machine — stub type used by many leading automobile manufacturers.

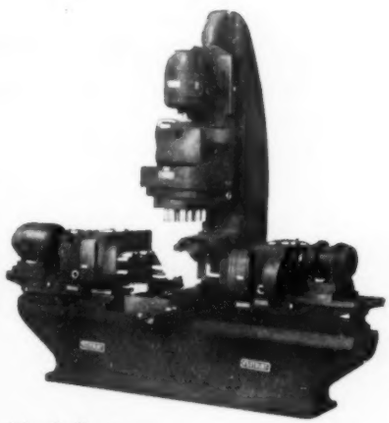
TURNING

The New Footburt Single Spindle Automatic Bar Machine—for quick set up and fast production.

TAPPING

FOOTBURT offers tapping machines in types and sizes to meet all demands of modern production, including: Lead Screw and Hand Feed Single and Multiple Spindle Way Tapping Machines, Nut and Coupling Tapping Machines.

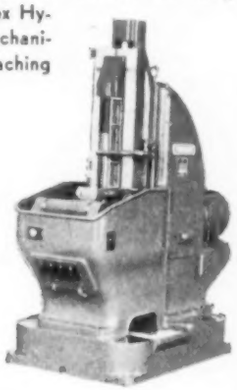
Lead Screw Tapping Machines. Units may be mounted in any position and combined to operate simultaneously with drilling units.



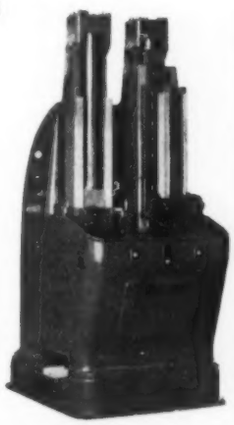
34-spindle, 3-way Lead Screw Tapping machine

SURFACE BROACHING

FOOTBURT offers broaching machines from the smallest to the largest units: Single Slide Hydraulic Surface Broaching Machines, Duplex Hydraulic and Mechanical Surface Broaching Machines.



Single Slide Hydraulic Surface Broaching Machine



Duplex Surface Broaching Machine

THE FOOTBURT COMPANY

Pioneer in Better Drilling Methods

Cleveland, Ohio

Building *Hy-Draulic* Machine Tools

. . . as Fast As It Can Be Done Right . . .

Bases in Bunches for 36" Openside Shapers

Compactly piled, a bunch of base castings for 36″ Hy-Draulic Openside Shapers is the next scheduled job for the long planer behind them. Then . . . down the line they go, from operation to operation; assembling, testing, final inspection, boxing, and shipping. Close follow-up keeps everything moving steadily, and highest standards of accurate workmanship are maintained all along the line.

Out on the job, 36″ Hy-Draulic Openside Shapers handle such a wide variety of work so effectively that they pay for themselves quickly, earn handsome net profits for their users, and frequently bring us early repeat orders to handle future requirements.

36″ *Hy-Draulic* Openside Shaper

Investigate!

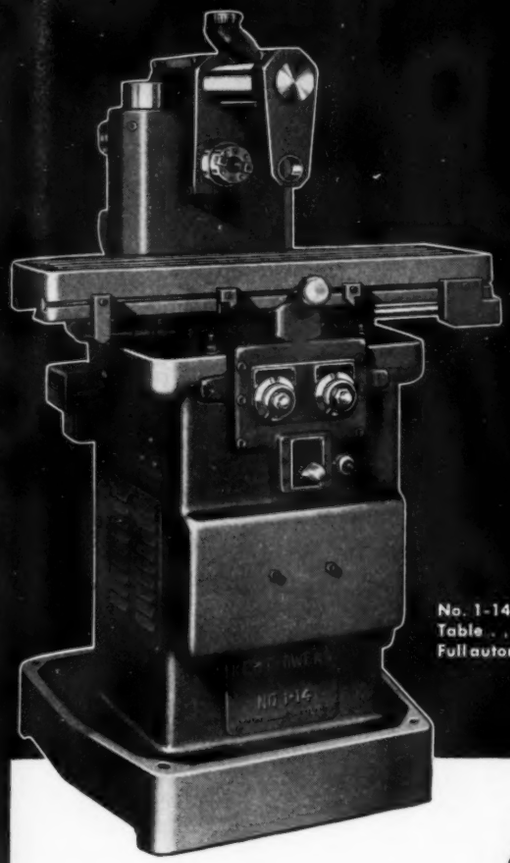
Find out why the 36″ Hy-Draulic Openside Shaper can be one of your most profitable machine-tool investments. Get the facts in detail from our Bulletin 382 which will be mailed postpaid promptly on request.

Hy-Draulic
Reg. U. S. Pat. Off.

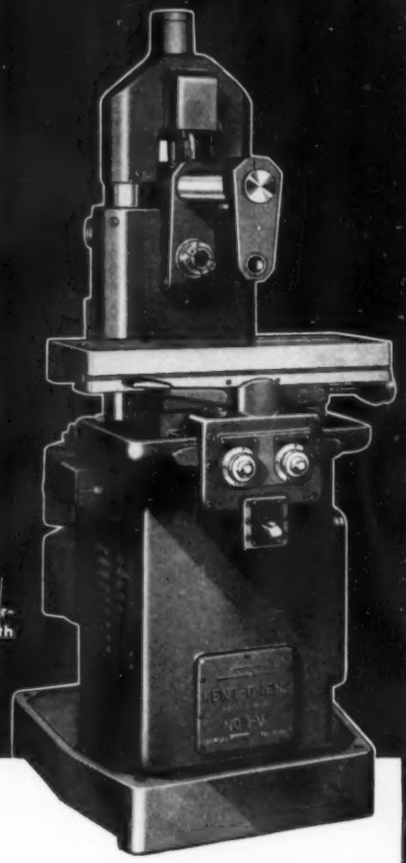
Shapers . . Planers . . Slotters . . Shaper-Planers

ROCKFORD MACHINE TOOL CO.

ROCKFORD, ILLINOIS, U.S.A.



No. 1-14 . . . 32" x 9" Table . . . 14" Travel . . . Full automatic Table Cycle



No. 1-V . . . 5½" Vertical Head travel with automatic cycle

Call on

KENT-OWENS

. . . for ALL your light and medium milling operations

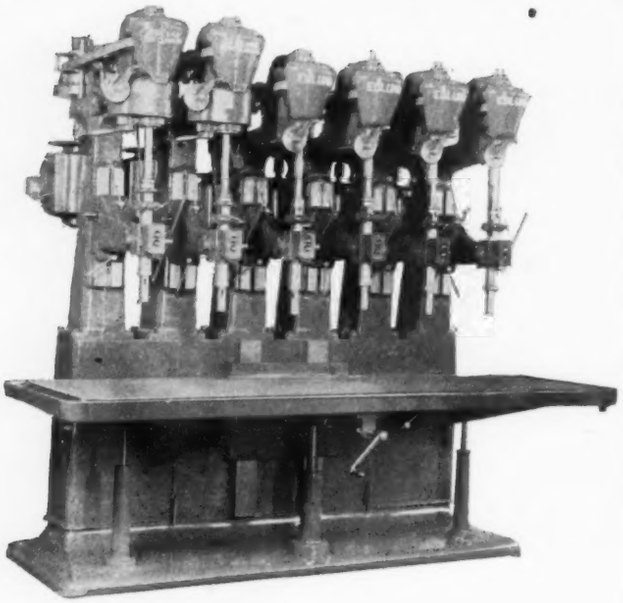
Kent-Owens Milling Machines offer rigid, compact design . . . simple, dependable hydraulic feed . . . wide spindle speed range with *only two* gear contacts and many other important features demanded by practical shop men everywhere. Write for bulletins or submit your milling operations to us for a production estimate . . . no obligation. Kent-Owens Machine Company, Toledo, Ohio.

KENT OWENS TOLEDO OHIO

No. 1-M . . . 25" x 9" Table . . . Hand lever movement to both Table and Head

No. 1-8 . . . Simple automatic Table Cycle . . . 25" x 9" Table

EDLUND



Precision with Economy

Because of their rigid construction the Edlund line of drilling machines provide the maximum of precision combined with economy of operation. The same machines that are considered tops for precision instrument manufacture are also tops in high production lines.

These machines are available in several sizes from ⅜" to 1¼" capacity up to eight spindles, with Motor-on-Spindle, Vertical motor or belted drive.

Power feed, reversing motor, back gears, coolant system and many other useful extras are also provided.

Prompt Deliveries

All of these machines are available for prompt delivery.

Write for descriptive bulletins and the name of our nearest dealer.

EDLUND MACHINERY CO., Inc.
CORTLAND, N. Y., U. S. A.

OO HOLES BY EDLUND OO
OO ARE LOW COST HOLES OO

NEW!!

40-H INDEX Vertical Mill

IT MILLS
slots, keyways, cavities, irregular curves — with end mills ⅛ to ¾ in. in diameter in tool steel.

IT DRILLS
to accurate locations without layouts.

IT BORES
up to 3-in. holes in steel — vertically, horizontally or at angles.

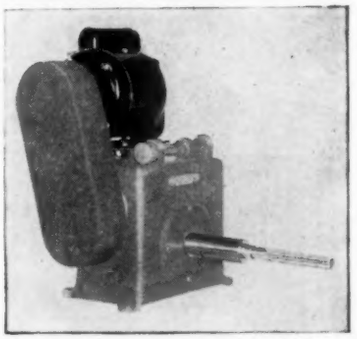
IT HAS VERNIERS
for locating 8" x 16" at one setting

Send for Free Folder

BLANK and BUXTON MACHY. CO.
JACKSON, MICH.

ELIMINATE HAND REAMING!

SPEED UP FINISHING OPERATIONS
with the
NEW CATSKILL POWER REAMING MACHINE



Capacity—up to 1 3/16" reamer-mandrel bored for No. 3 Morse Taper—speeds, 95, 120 and 165 R.P.M.—1/3 H.P. 110-220 V., 60 cycle, single phase capacitor motor with cord and plug. (Other motor characteristics available). Bench and pedestal types.

Here at last is the ideal tool for "mechanizing" hand finishing jobs, removing burrs from bores of parts that have been keyseated or drilled for set screws, countersinking, counterboring and chamfering—in fact for all kinds of finishing work which has involved slow, costly hand operations.

With the big savings you can make for the moderate investment required, the "CATSKILL" pays for itself over and over again. Its profit-earning value has been proved in many shops—on single piece and quantity work.

INVESTIGATE its possibilities today by writing for complete details.

CATSKILL METAL WORKS, INC.
CATSKILL, NEW YORK

Avey

. . . YOUR QUICKEST, SUREST "AVENUE" TO LOWER COST DRILLING!

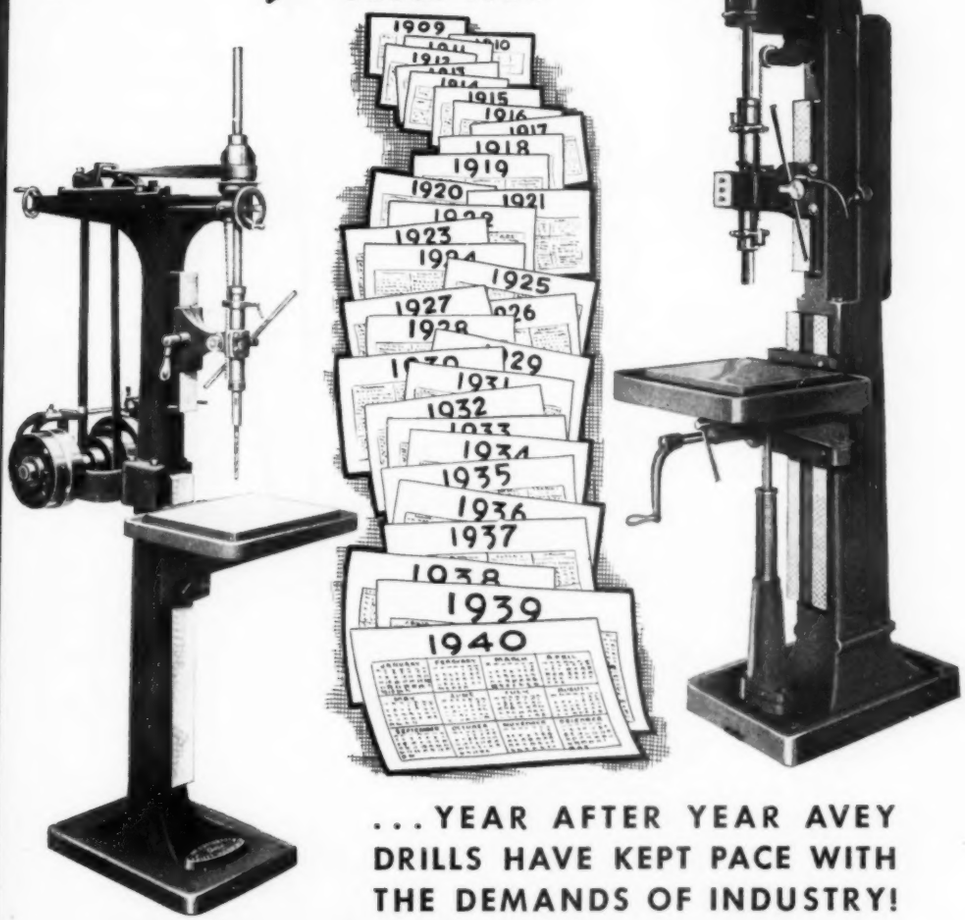
ONE WAY

Modern

DRILLING AND TAPPING EQUIPMENT

Every year

SINCE 1909



1¼" TO .010"

The MOST COMPLETE LINE OF HIGH SPEED BALL BEARING DRILLING AND TAPPING MACHINES

. . . YEAR AFTER YEAR AVEY DRILLS HAVE KEPT PACE WITH THE DEMANDS OF INDUSTRY!

Avey for QUALITY ECONOMY DEPENDABILITY

THE AVEY DRILLING MACHINE CO.

CINCINNATI . . . OHIO

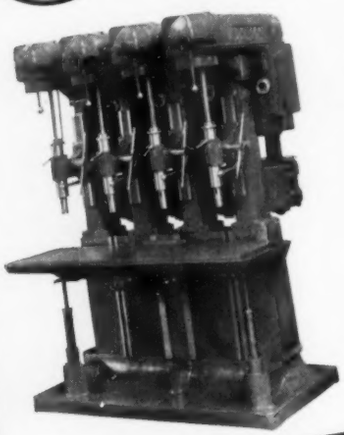
FOUR OF A KIND...

EACH ONE SPECIALLY SUITED TO A PARTICULAR TYPE OF PRODUCTION REQUIREMENT

BIGGER PROFITS

FOR ALL SMALL DRILLING NEEDS UP TO 1¼" . . .

THE FOSDICK HIGH SPEED BALL BEARING SENSITIVE

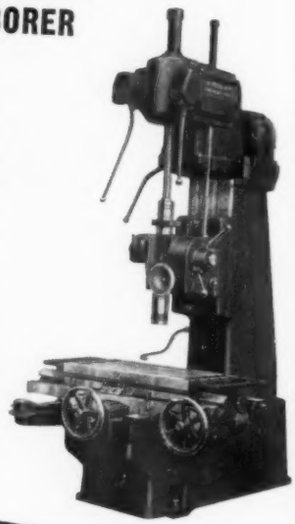


Available with 6, 9, 12, or 18 speeds, from very low to extremely high spindle speeds, this Fosdick sensitive drill is distinguished throughout for its advanced design. Any number of spindles up to six can be supplied, and any spindle can be provided with power feed, hand feed, or tapping attachment.

BIGGER PROFITS

FOR ECONOMICAL OPERATION WITH OR WITHOUT JIGS . . .

THE FOSDICK JIG BORER



If you are looking for equipment which can enable an average drill press operator to perform accurate work on jigs, fixtures, and miscellaneous production parts and, at the same time, can make small quantities economically possible . . . Fosdick offers you this dual advantage, at a small investment, in this precision machine. Details on request.

BIGGER PROFITS

FOR HEAVY DUTY, PRECISION DRILLING SERVICE . . .

THE ECONOMAX HYDRAULIC RADIAL

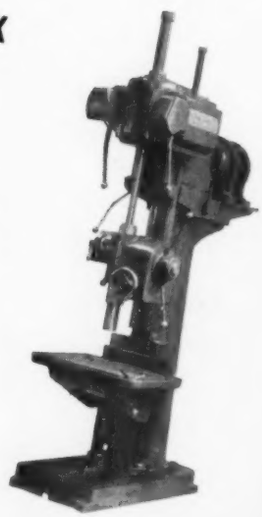
Rugged construction throughout; 36 spindle speeds; 18 feeds; centralized hydraulic control, which includes variable hydraulic traverse to the head, hydraulic column clamp and hydraulic arm clamp. These are but a few of the many features found in Fosdick radials which promise increased production.

BIGGER PROFITS

AND FOR HIGH PRODUCTION ON WORK REQUIRING A 21", 25", OR 30" MACHINE . . .

THE ECONOMAX UPRIGHT SUPREME

Like all Fosdick products, here is a machine which offers in every one of its many outstanding features a greater inherent ability to improve production though increased capacity, ease of operation, greater accuracy, and economy. The *Economax Upright Supreme* warrants your immediate investigation.



FOSDICK MACHINE TOOL COMPANY

CINCINNATI, OHIO

These NEW

LE MAIRE

HYDRAULIC-FEED DRILLS

already are cutting costs and increasing production in leading plants

•

INVESTIGATE THEM NOW

• In aircraft, automotive and farm-implement plants, these new Le Maire drilling machines have definitely proved their ability to turn out quality work *faster* and *cheaper*.

Vertical types are built in sizes 5, 10, 20 and 30. The horizontal types, designated Nos. 40 and 60, combine two No. 20 or two No. 30 opposed heads on a horizontal bed.

Details on these new machines will be sent by return mail without obligation. Write today.

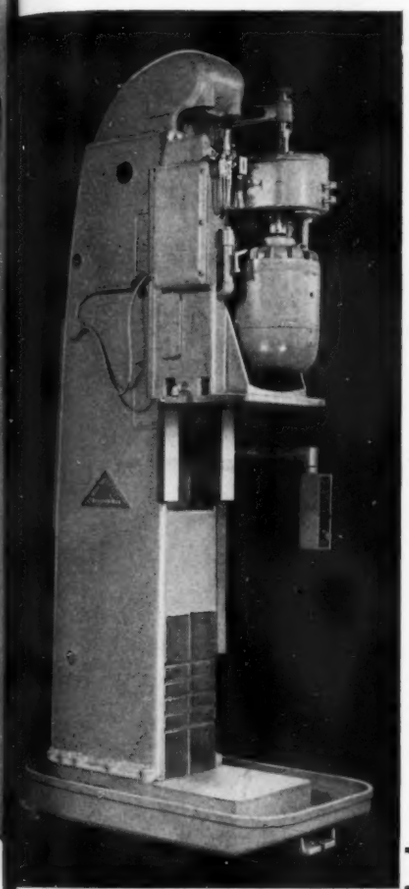
•

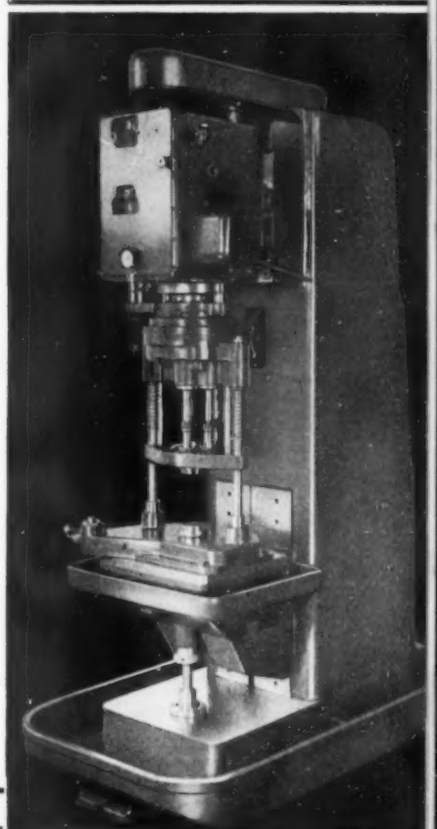
#1—STANDARD NO. 20
The head slides on hardened and ground ways. Work holding fixture mounted on machine bed. Tooled for drilling all stud holes in automobile cylinder blocks. Multiple spindle head and fixture not shown.

#2—STANDARD NO. 5
Le Maire Vertical Drill, hydraulic feed, for fast production with single or multiple spindles. Does drilling—boring—reaming—counterboring—hollow milling—chamfering and comparable operations.

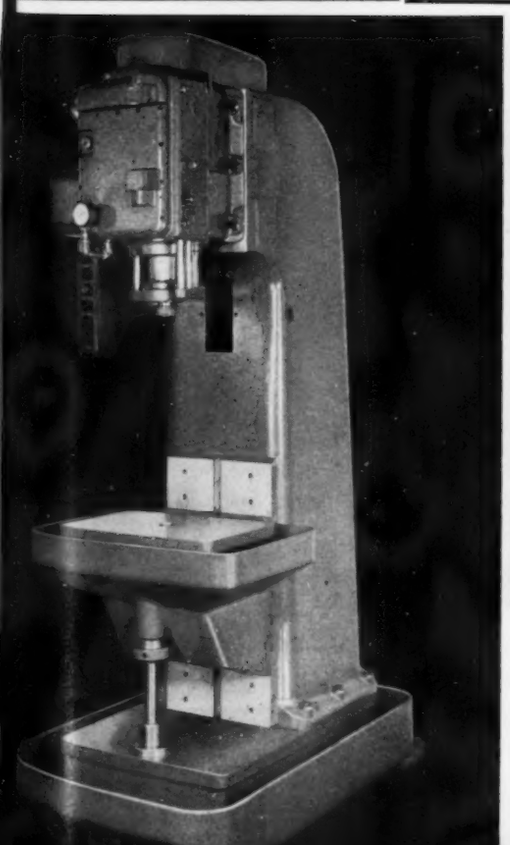
#3—STANDARD NO. 60
Two-way horizontal machine — performs 5 operations simultaneously, boring holes in perfect alignment. Center drilling—core drilling—drilling—rough boring—finish boring. Six fixtures on indexing tru-turret hold six pieces of work.

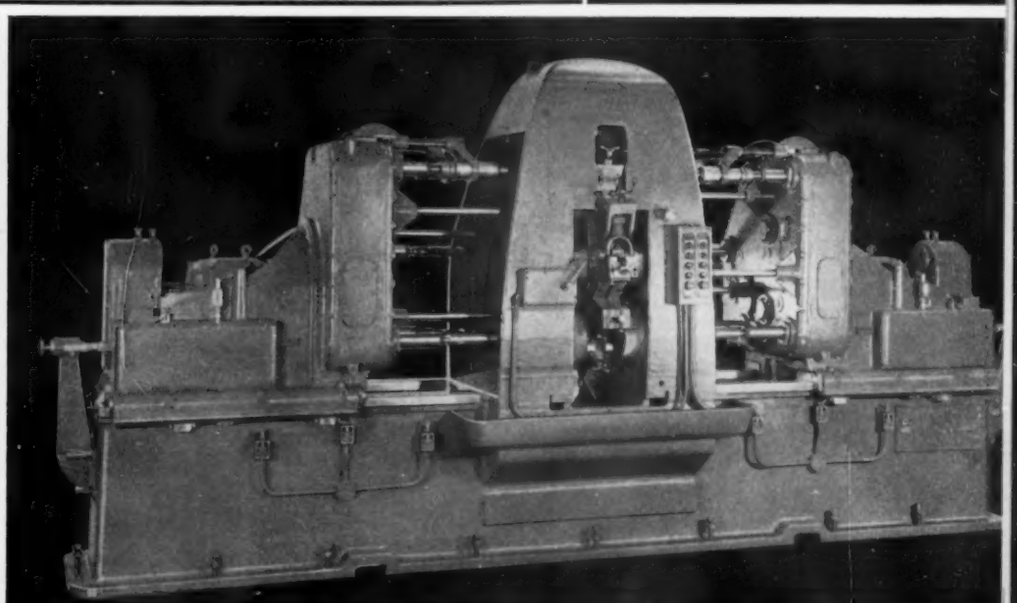
#4—STANDARD NO. 10
General features comparable to No. machine. Multiple head and bushing plate, tooled to drill clearance holes on aircraft "Master" connecting rods. One operator can run two units.





#1—LEFT . . . #2—LOWER LEFT . . . #3—BELOW . . . #4—RIGHT





LE MAIRE TOOL & MANUFACTURING CO.

2657 SO. TELEGRAPH RD.

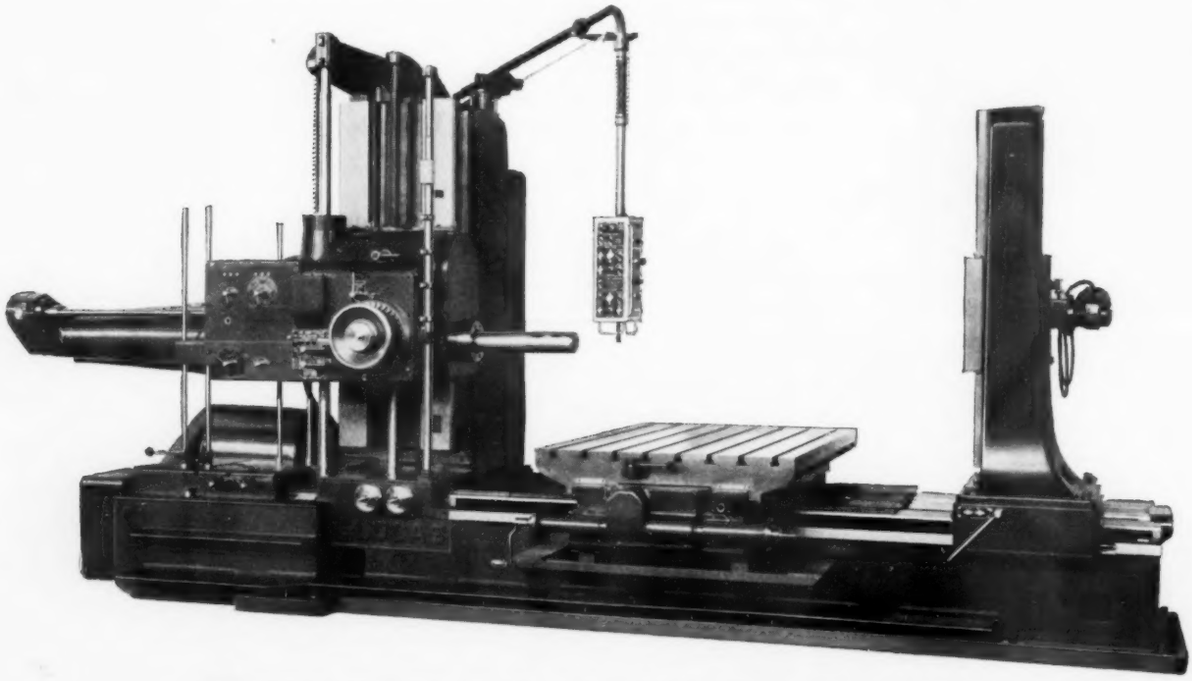
Dearborn • • • **Michigan**

LOOKING AHEAD *with* LUCAS

■ Any check up on equipment being used today in metal working shops will reveal the fact that many machines have outlived their economic value.

■ Most shops will agree that obsolete equipment is a liability. At the present time, however, modernization programs are being handicapped by a situation in the machine tool industry which makes it difficult, if not impossible, to get early deliveries on modern, improved, cost-cutting equipment.

■ While the time is inopportune in many cases for placing new machines on production lines, it *is* an opportune time to be making plans for the future. There is no better time than the present to evaluate the possibilities of new equipment by considering the type and make of machine tools which offers the greatest opportunities for improved quality of product and consequent future savings and profits.



■ Careful exploration of the possibilities of Lucas Horizontal (Combination) Boring, Drilling, and Milling Machines on your work will convince you that these machines will meet your most exacting requirements in the future as in the past.

■ It will pay you to look ahead—NOW.

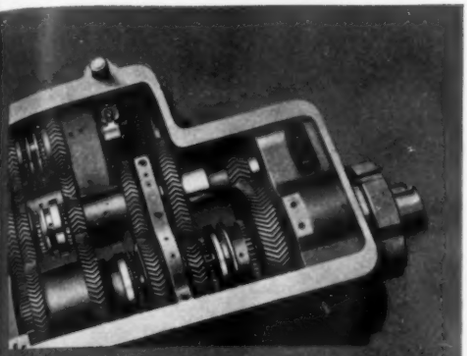
LUCAS MACHINE TOOL CO.

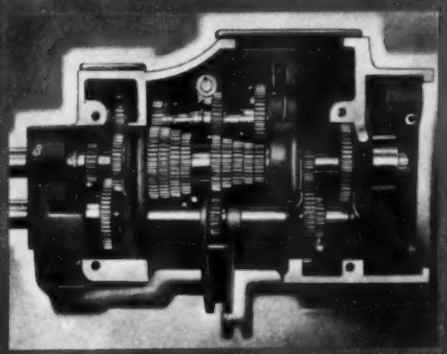
NOW AND ALWAYS OF **CLEVELAND, OHIO**

MODERN, PROVED, ENGINEERED FEATURES

assure modern, smooth, profitable performance

of Sidney Lathes



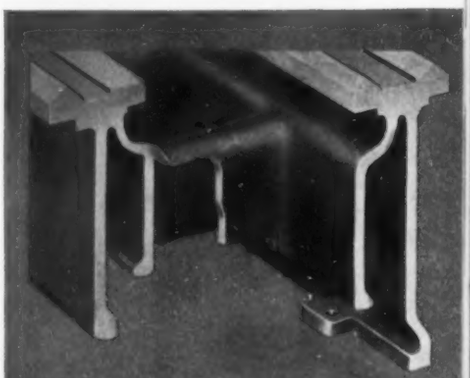


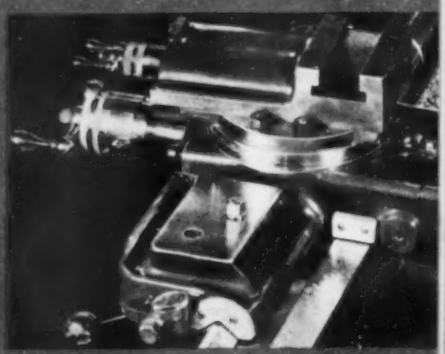
Sidney Precision-Built geared head lathes—in 14" to 36" sizes—offer features which have actually anticipated requirements in sustained accuracy, high production and versatility. They are definitely modern machines for modern production.

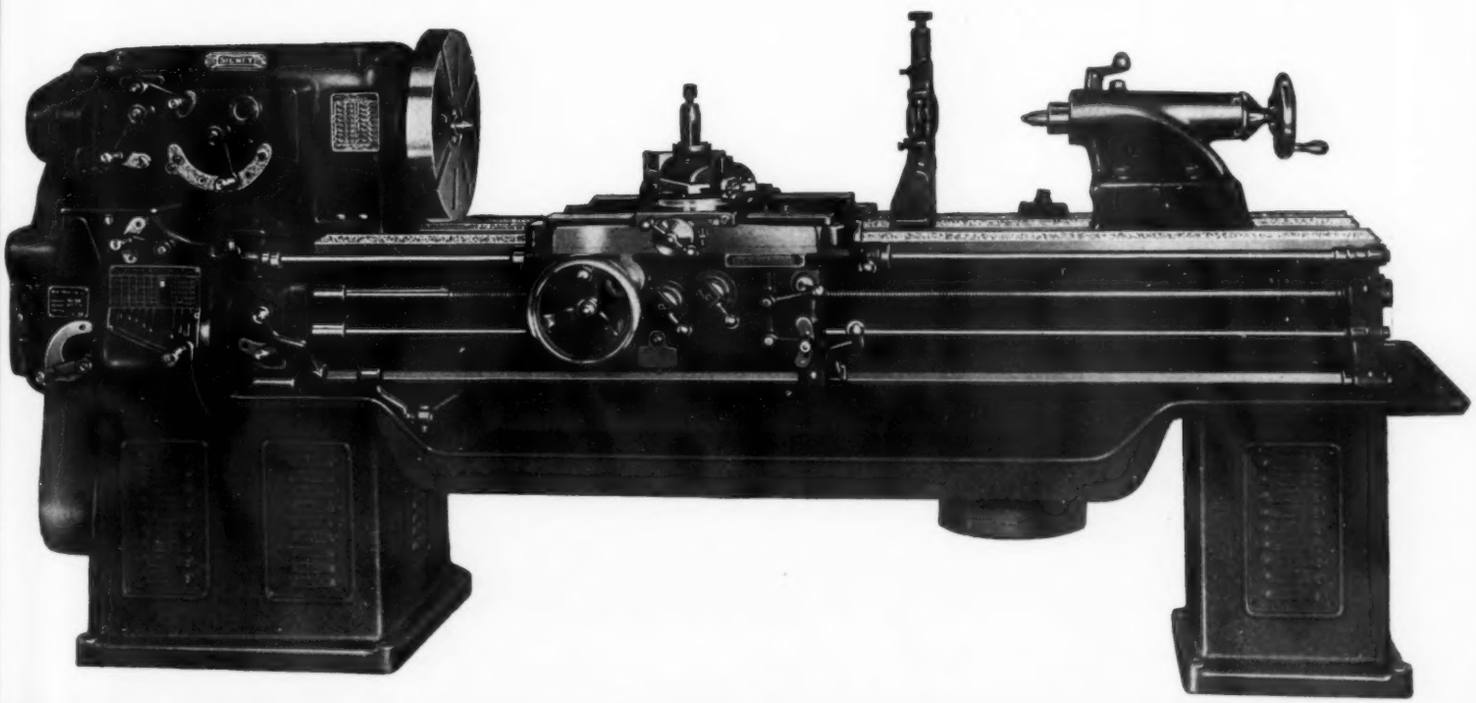
For example, the headstock, which provides sixteen spindle speeds in geometrical progression; the gears themselves of the continuous tooth herring-bone type with greater tooth contact, greater strength and smoother in operation. Each shaft runs on Timken Precision tapered roller bearing; sliding gears are mounted on shafts with multiple integral splines.

Other advanced features include automatic lubrication; (internal gear tooth clutch construction which reduces backlash;) a four-wall bed of semi-steel with closely set double wall cross girts for utmost stability; generous V-ways; Neoprene wipers; large micrometer dials; double plate aprons with out-board supports.

A new engineering bulletin is available on request and gives complete detailed information. Send for a copy and study the many carefully engineered features which stamp Sidney Lathes "MODERN" in every detail.

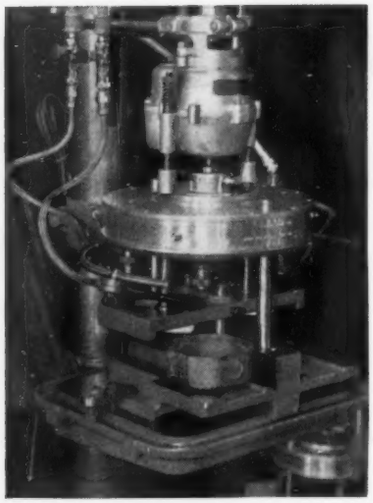






SIDNEY MACHINE TOOL CO., SIDNEY, OHIO

Ettco-Emrick makes DRILLING and TAPPING Modernization possible and profitable . . .



ETTCO MULTIPLE SPINDLE TAPPING AND DRILLING HEADS make possible production increases at low tool cost because they are completely engineered and standardized in design. You give us the center distances or samples and we'll save you money over ordinary methods of tapping or drilling small holes.

ETTCO VERTICAL TAPPING MACHINES are available for small single or multiple tapping, are manually operated and outstanding in accuracy and speed. No skill or delicate touch is required. Operation is easy, simple and practical.

ETTCO TAPPING ATTACHMENTS convert any modern drill press into a fast, sensitive tapping machine. Friction clutch drive protects taps; tap idles "in" and doubles tap cutting life; spindles turn on ball bearings, idler gears on needle bearings; helical gears insure quietness and efficiency.

ETTCO also offers a modern, keyless, hand operated, self tightening Drill Chuck that holds securely and accurately.

ETTCO offers a modern, positive drive, visible grip Tap Chuck. An ideal universal tap holder.

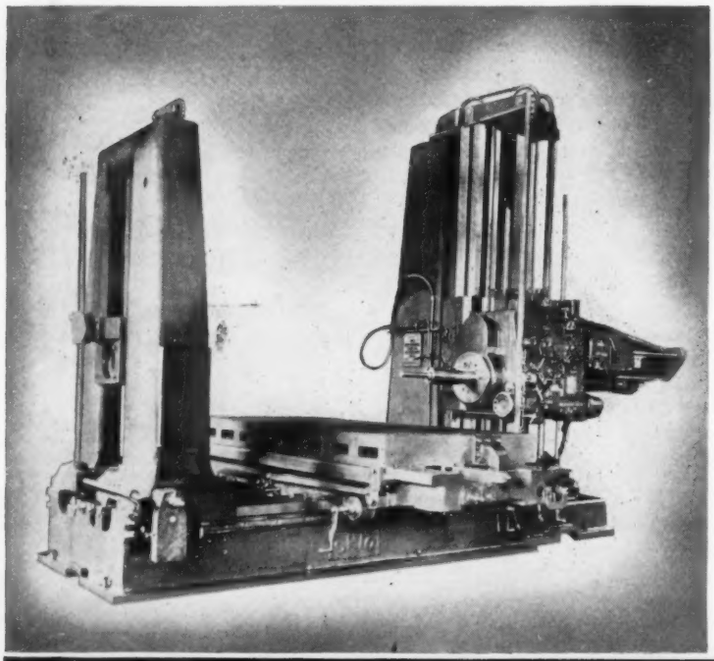
ASK ETTCO TO SHOW YOU HOW TO SAVE—

Send parts or drawings and let us engineer the job. We'll save you money and step up your production. Write for bulletins on modern ETTCO Tools.

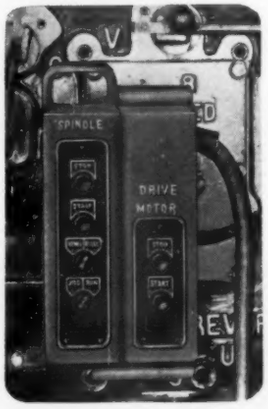
Ettco-Emrick

DRILL CHUCKS
TAPPING DEVICES
TAPPING MACHINES
MULTIPLE HEADS

ETTCO TOOL COMPANY
594 JOHNSON AVENUE
BROOKLYN NEW YORK



PORTABLE SPINDLE CONTROL



Start, stop, forward, reverse, run or jog of the spindle can be controlled from near or remote points. A decided operating advantage.

"Ohio Horizontals"

Engineered to meet modern production requirements with tool room accuracy. Boring, milling, drilling, tapping, thread chasing and light slotting operations all performed without removing the job from the machine. Write for bulletin.

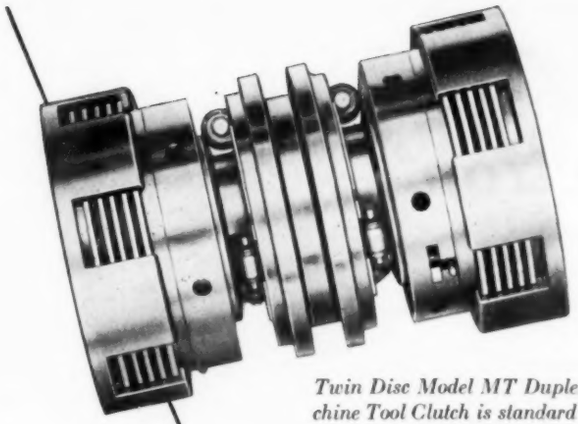
THE OHIO MACHINE TOOL CO.

KENTUCKY, OHIO

MANUFACTURERS OF

SHAPERS „OHIO DREADNAUGHT" PLANERS

HORIZONTAL BORING, DRILLING and MILLING MACHINES



Twin Disc Model MT Duplex Machine Tool Clutch is standard in the American 32-speed Hole Wizard.

No machine can be any better than the sum of its parts!

● The new "American 32-speed Hole Wizard" is distinguished by the care and consideration given in the selection of its component parts.

For example—the elevating mechanism forms one of the most important functions of radial drill operation. It controls the raising and lowering of the heavy radial rod and in normal service is called upon to function at frequent intervals. It is highly significant that in the development of this important unit, "American" engineers selected Twin Disc Multiple Disc Clutches and even more significant that this selection was made following years of experience with Twin Disc Clutches in other "American" products.

We are proud of the fact that Twin Disc Clutches were selected for this important service and feel deeply gratified that Twin Disc Clutch Company's claims for quality and performance have again been recognized by such a prominent machine tool manufacturer as the American Tool Works Company, of Cincinnati.

● **California:** Los Angeles, Charles W. Carter Co.; San Francisco, Charles W. Carter Co. **Colorado:** Denver, Liberty Trucks & Parts Co. **Illinois:** Chicago, Wisconsin Industrial Parts. **Kentucky:** Lexington, Wombwell Auto Parts Co. **Massachusetts:** Boston, Rapp Huckins Co., Inc. **Kansas:** Great Bend, Scheufler Supply Co. **Maine:** Portland, Southworth Mach. Co. **Louisiana:** New Orleans, Mechanical Equip. Corp. **Michigan,** Detroit, Whitney Bros. **Minnesota:** St. Paul, Truck Parts, Inc. **Missouri:** St. Louis, Auto Parts Co. **New York:** Buffalo, Edw. W. Rode; New York, Twin Disc Clutch Parts & Service of New York, Inc. **Ohio:** Cincinnati, C. McCash; Cleveland, Industrial Eng. Parts. **Oklahoma:** Tulsa, Twin Disc Clutch Co. **Oregon:** Portland, Berg Evans Chain Co. **Pennsylvania:** Pittsburgh, Contractors Equip. Ser. Co.; Philadelphia, Twin Disc Clutch Parts & Service of Philadelphia. **Tennessee:** Knoxville, Automotive Equipment & Supply Co. **Texas:** Dallas, Twin Disc Clutch Co.; Fort Worth, John Muller Co.; Houston, Portable Rig Co., Inc.; Houston, John Muller Co. **Utah:** Salt Lake City, Lund Machinery Co. **Virginia:** Richmond, Standard Parts Corp. **Washington:** Seattle, Berg Evans Chain Co.

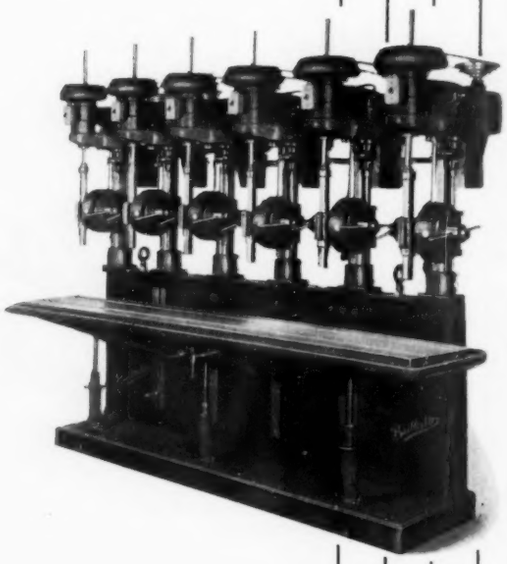
TWIN DISC CLUTCHES

REG. U. S. PAT. OFF.

TWIN DISC CLUTCH COMPANY, 1334 RACINE STREET, RACINE, WISCONSIN

When the Call Comes Thru to *"Speed Up Production"*

BE READY with these Buffalo MACHINES

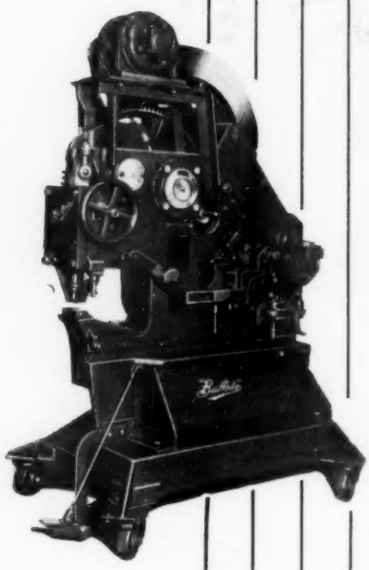


DRILLS

For production or sensitive drilling work. Built to highest machine tool standards. Hand or power feed. Bulletin D-37 gives details.

IRON WORKERS

That make fast, easy work of those tough shearing, punching, notching and slitting jobs. Bulletin 360 has full information.



BENDING ROLLS

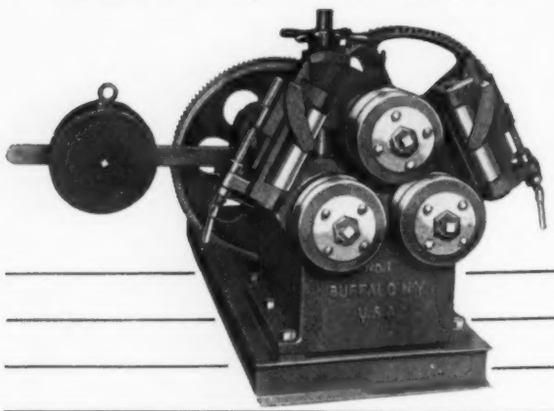
That have cut bending costs as much as 90% and stepped up production accordingly. Bulletin 352 shows capacities.

If you want better, faster work, these machines will help you to get it. Write for literature

BUFFALO FORGE COMPANY

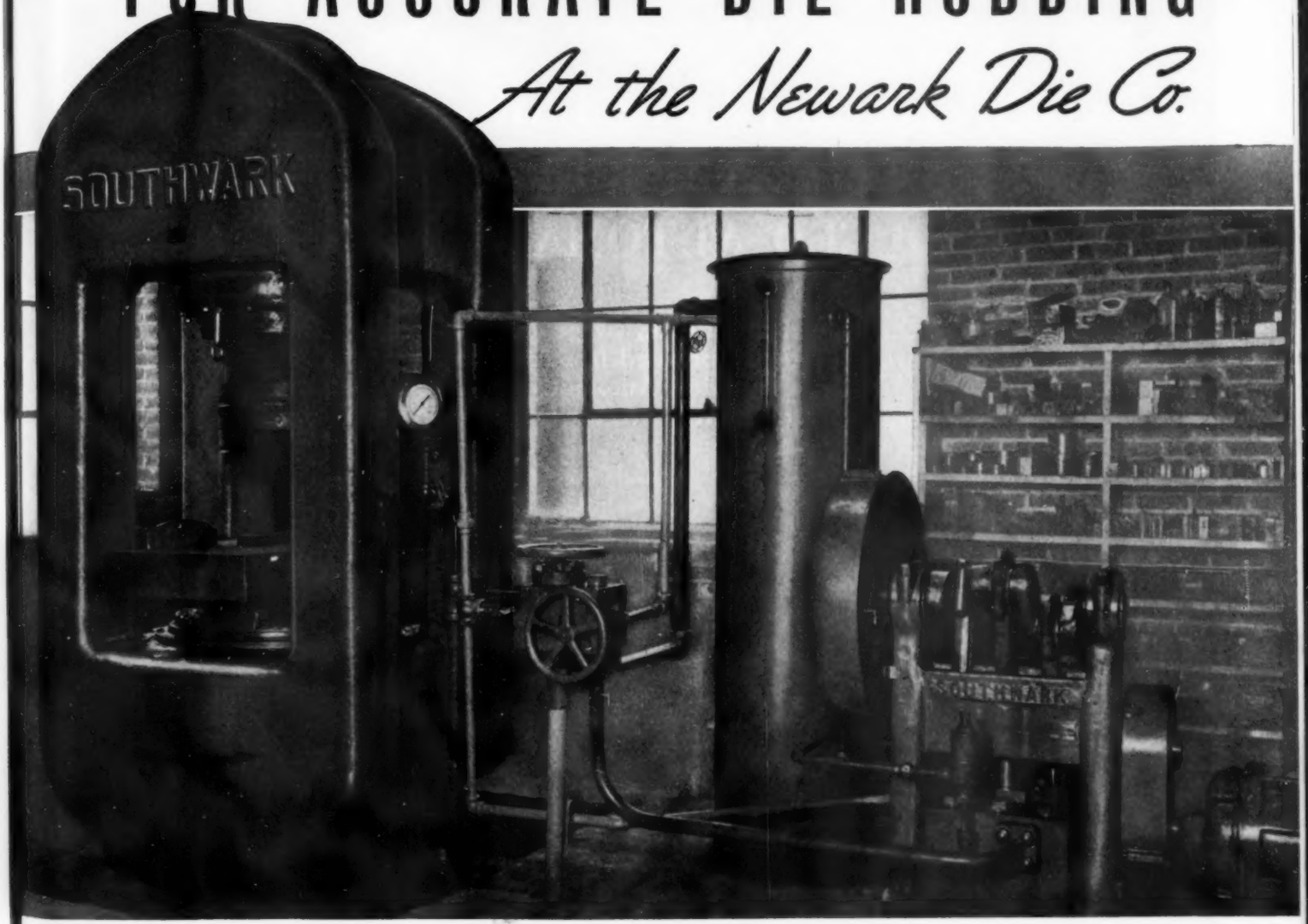
448 Broadway **Buffalo, N. Y.**

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



FOR ACCURATE DIE HOBBING

At the Newark Die Co.



● Extremely accurate in operation by virtue of its rugged one-piece steel casting and long cylinder guide this 2,000-ton Southwark hydraulic press is used in making all types of molds for both thermo plastic and thermo setting materials at the Newark Die Co.

Absolute control of ram speed keeps flow rate constant and enables proper flowing of the cold soft steel being hobbed. The same finish of the hardened steel hob is thus imparted to the die cavity and duplicate cavities can readily be obtained.

The two-pressure Southwark pump provides low pressure approach stroke with automatic change over to a high pressure working stroke, ensuring efficient and economical operation. Consult with Southwark for complete die hobbing units, designed and built to meet your specific requirements.

BLW
THE BALDWIN GROUP

BALDWIN SOUTHWARK

Division of THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

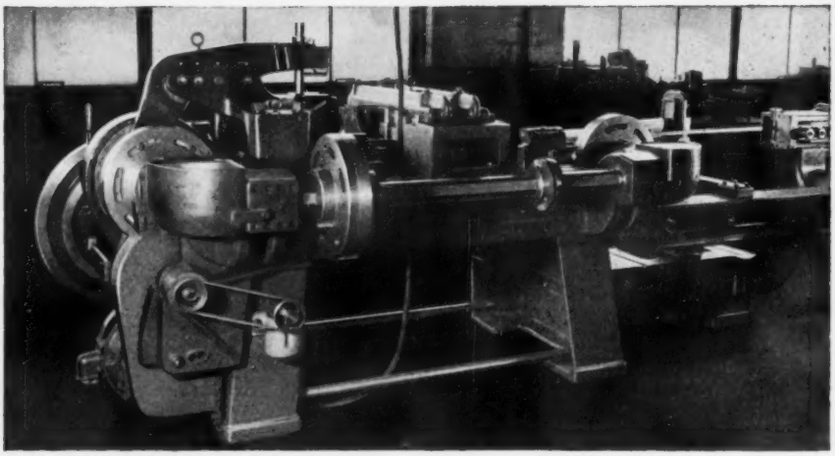
Presenting the Most Powerful

TO PRODUCE PARTS LARGER THAN COULD EVER BEFORE BE PRODUCED AUTOMATICALLY

An automatic machine to pierce, blank, swage, form and shave parts larger than could ever before be fabricated from coil stock – that is the new No. 44 U. S. Multi-Slide machine. Automotive and electrical parts heretofore requiring separate punch presses for blanking, piercing, trimming, swaging and forming can now be completed in a single machine, with great precision and at high speeds.

The No. 44 Multi-Slide is twice as large as the present No. 33 machine. In it are incorporated all of the features of the smaller Multi-Slides . . . plus additional features advantageous to its size. The length of feed can be varied up to a maximum of 21" and the machine will take stock up to 4" wide.

Send us a blueprint or sample of a high production job in your shop and let us submit figures on Multi-Slide tools and production speeds.



Features of Construction

STRAIGHTENING ROLLS —built with adjustable pitch so that spacing of rolls may be set for any type stock.

AUTOMATIC OILING SYSTEM —a pressure lubrication system is standard equipment.

GEARMOTOR DRIVE —the machine is practically noiseless in operation.

TWO DISC CLUTCH —for combined clutch and braking action. Makes this machine actually easier to handle than many of the smaller sizes.

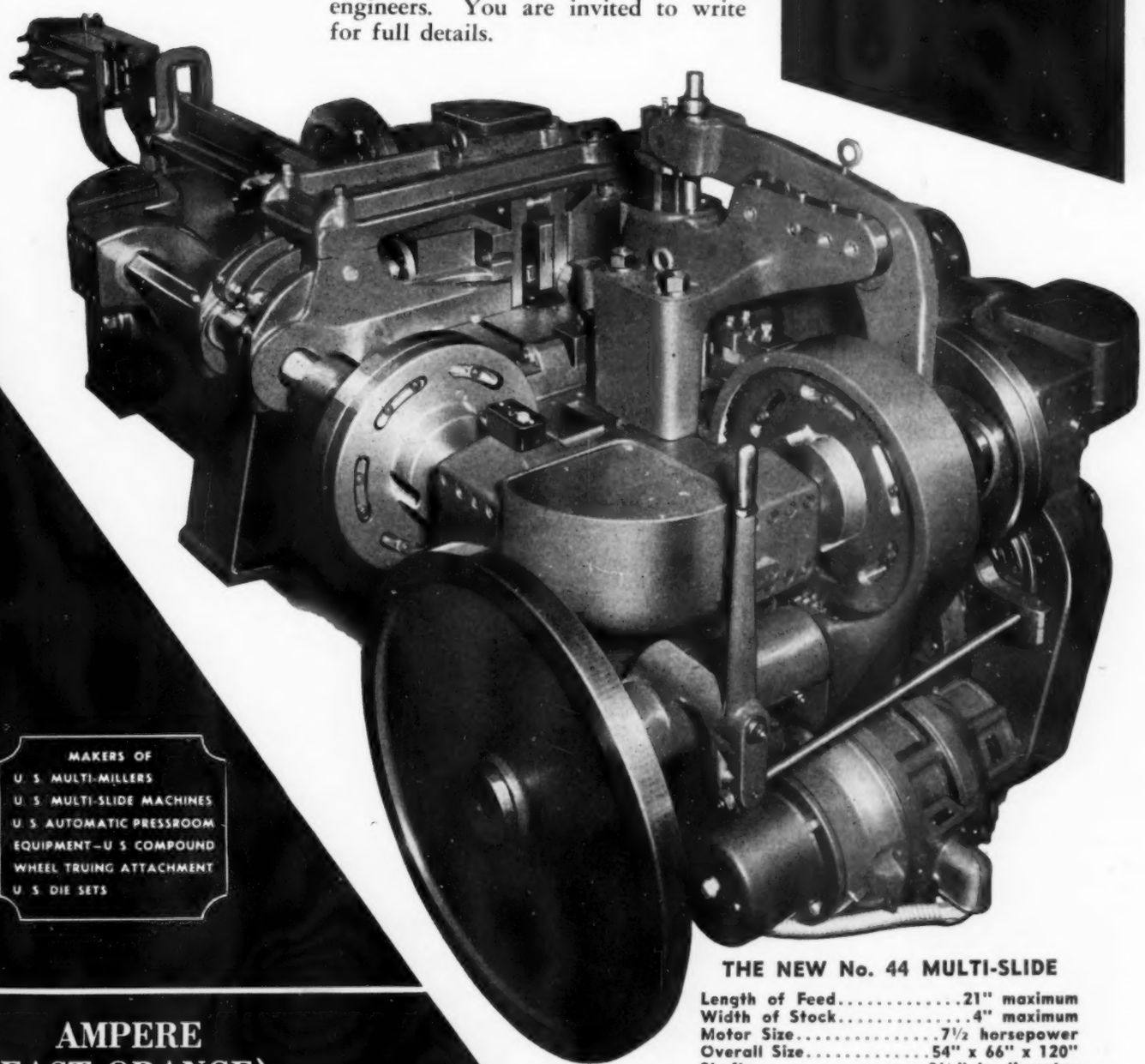
PRODUCTS

U. S. TOOL COMPANY, Inc.

MULTI-SLIDE ever built!

An Invitation

Color motion pictures of the New MS-44 Multi-Slide and other U. S. Tool Company Equipment are available for showing before groups of interested engineers. You are invited to write for full details.



MAKERS OF
U. S. MULTI-MILLERS
U. S. MULTI-SLIDE MACHINES
U. S. AUTOMATIC PRESSROOM EQUIPMENT—U. S. COMPOUND WHEEL TRUING ATTACHMENT
U. S. DIE SETS

THE NEW No. 44 MULTI-SLIDE

Length of Feed	21" maximum
Width of Stock	4" maximum
Motor Size	7½ horsepower
Overall Size	54" x 66" x 120"
Shafts	3¼" in diameter
Cams	17" in diameter
Throw of Cams	Front 2" / Side 3" / Rear 1¾"

AMPERE
(EAST ORANGE)
N. J., U. S. A.

LOCATE AIRCRAFT PLANTS INLAND*—

Away From Our Vulnerable Coasts

SAYS THE WAR DEPARTMENT

***THE LOGICAL LOCATION IS**

Illinois

8 GOOD REASONS For Locating Aircraft and Parts Plants in Illinois

1 GOOD LABOR SUPPLY. Illinois has 2,500 metal working plants employing 300,000 wage earners, proof of the adequate supply of workers of the type required in aircraft and parts manufacturing.

2 MATERIALS AND PARTS. Illinois is located close to abundant sources of supply for materials and parts—is in the center of steel and non-ferrous metal foundries, and machine tool manufacture, so important to this industry.

3 TRANSPORTATION. Illinois is the center of railroad and air transportation, with direct lines to every section of the State and country—has the finest system of paved roads of any state.

4 CENTRAL LOCATION. Illinois is near the geographical center, the industrial center, and center of population of the Nation, and is the hub of the huge Middle West market.

5 IDEAL TESTING CONDITIONS. Illinois' wide range of climate permits testing under all flight conditions. Both land and water ports are available.

6 LEAST VULNERABLE LOCATION. Illinois is a safe distance inland from all coasts—a vital consideration for uninterrupted operations under all circumstances.

7 A LEADER IN AVIATION RESEARCH. Illinois has extensive facilities for research in aviation, with several great schools specializing in this important function.

8 MILITARY TRAINING BASES. United States Army aviation training bases in Illinois (Chanute Field at Rantoul, and Scott Field at Belleville) permit close coordination of research, design, manufacturing, testing, and determination of requirements for both commercial and military use.

Special Confidential Report to Executives

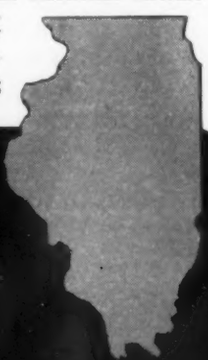
Write the Illinois Development Council at Springfield, Illinois, today, for a practical presentation of facts about Illinois pertaining to aircraft manufacturing and allied industries—a report that will enable you to evaluate the manufacturing and sales opportunities in Illinois—containing data on raw materials, labor, taxes, as well as on power, fuel, transportation, and product distribution facilities.

Correspondence is solicited from executives, but inquiries from others negotiating for responsible executives will also receive the same careful attention. You can write with full assurance that your inquiry will be kept strictly confidential. A truly practical report will be submitted for your study and consideration. No obligation will be incurred on your part, and no charge will be made for this valuable service. Why not write your letter today? Address—

INDUSTRIAL BUREAU
ILLINOIS DEVELOPMENT COUNCIL
SPRINGFIELD, ILLINOIS

Military, Federal and Industrial authorities agree that American aircraft manufacturers will benefit from Middle West locations. Investigate the outstanding advantages of locating your new plant or branch plant in the State of Illinois.

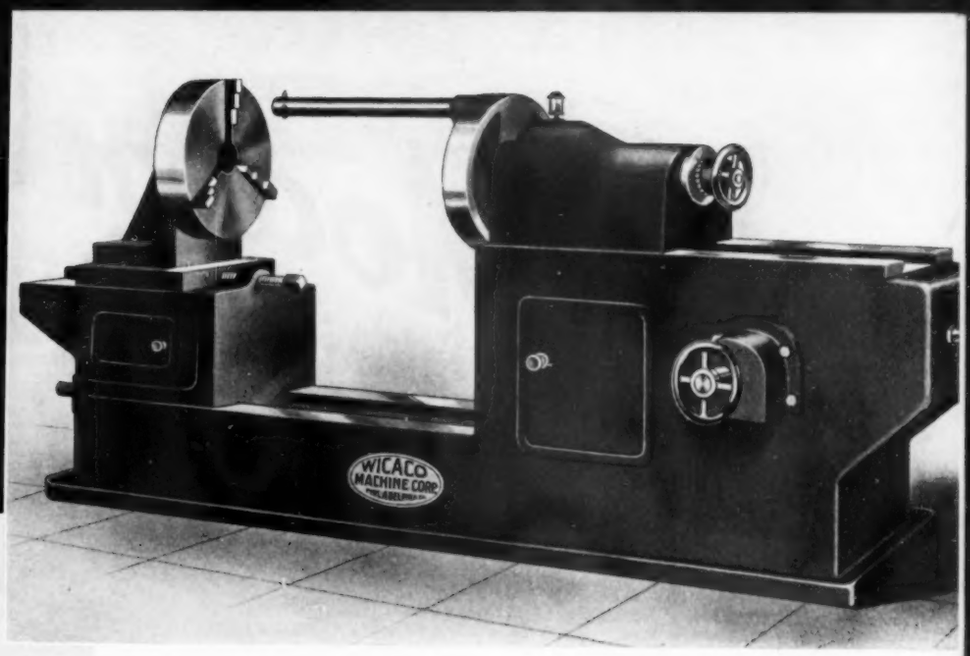
ILLINOIS DEVELOPMENT COUNCIL • Springfield, Illinois

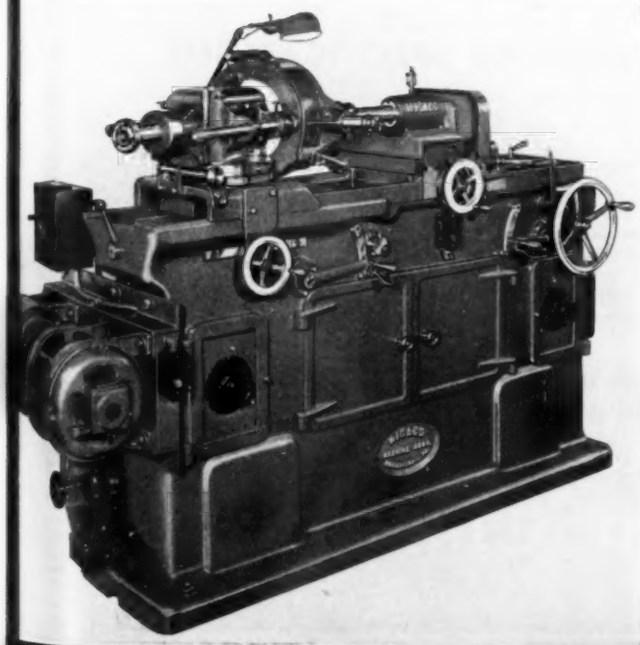


Secure ✓ STRATEGIC LOCATION
✓ PRODUCTION ADVANTAGES
✓ AMPLE LABOR SUPPLY

IN ILLINOIS

WICACO MACHINE TOOLS *for* PRODUCTION *with* PRECISION





WICACO HEAVY DUTY HORIZONTAL OIL GROOVER—a high speed production machine with a capacity much greater than any oil grooving machine yet developed. The bushing or any piece of equipment to be oil grooved is held rigidly in the non-revolving chuck. Since this work-holding chuck does not revolve, the machine is adaptable to holding odd size, irregular or unusual shaped machine members for either internal or external grooving. By removing the standard chuck and using special shape holding fixtures, any variety of unusual shapes can be now classified as a high production proposition. Handles bearings up to 20" in diameter and 22" long. . . . All the mechanical advantages of this new automatic machine are built almost entirely in the reciprocating tool head, where all controls are grouped for simplicity and ease of operation.

THE WICACO CONTINUOUS OIL GROOVER has a productive value unequalled by any other machine on the market, both as to quality and quantity of work produced. . . . Work is loaded and unloaded without stopping machine, saving time and reducing unit cost. . . . Quick change-over makes this machine adaptable for short runs. . . . Extensively used in grooving connecting rods, universal joints, retaining rings, shafts, etc. . . . The revolving spindle makes it possible to groove large, irregular pieces either internally or externally. When tool has reached its proper depth feed lever automatically returns to neutral position, saving time for removal of work from chuck. Produces up to 500 pieces per hour.

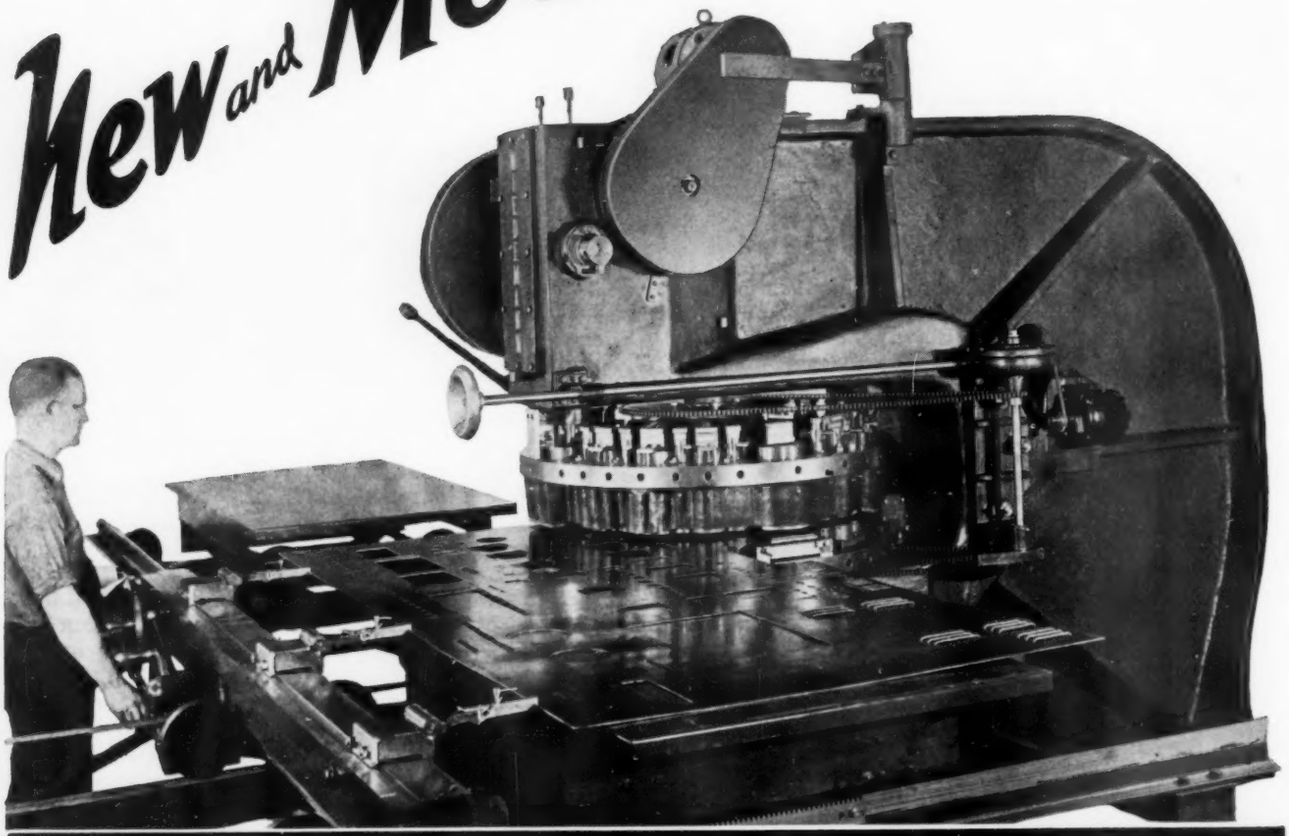
THE WICACO PRECISION INTERNAL GRINDER—For over 14 years, these extremely accurate machines have been economically producing for us, work requiring extremely close tolerances. While minor improvements on more recent models have increased their safety factor, and added to their convenience, basically they are the same machines that have given us exacting and faultless service . . . Features include Vibrationless Underslung Drive; Rigid Work-Head; Automatic Carriage Reverse; Carriage Stops graduated to .001"; Shipped ready to hook up to current and operate. . . . The Wicaco Precision Internal Grinder is very flexible and will add profitably to your tool room, assuring as it does, extreme accuracy and years of trouble-free operation.

WRITE TODAY FOR COMPLETE DETAILS.

THE WICACO MACHINE CORPORATION Est. 1868

TENTON AVE. & LOUDEN STS., WAYNE JUNCTION, PHILADELPHIA

New and Modern



The NEW TYPE R-8 POWER OPERATED TURRET PUNCH PRESS 54" THROAT

MODERN IN EVERY DETAIL...

. . . will locate holes in sheets up to 50" wide, 100" long, 1/8" thick QUICKLY—EASILY—ACCURATELY

This brand new Wiedemann Turret Punch offers one of the most economical methods for modernizing small lot production ever developed. It is available with or without table and with either hand or motor turret trip.

By means of the table, sheets can be accurately located under the punching station, any point desired may be reached directly for piercing, notching corners or cutting out openings.

Accurate motions are provided at 90° to each other, with each unit mounted on ball bearings for easy, quick settings. Movements by hand wheels are fast and conveniently made. A small lever at each hand wheel provides for clamping. Controls for turret indexing lock and switch and hand clutch lever are conveniently grouped and travel with the table.

Complete elimination of layout time, instantaneous die changing and easy operation with each piece finished at a single handling contribute to the remarkable speed and outstanding savings offered by this new machine.

CONDENSED SPECIFICATIONS

Capacity: Plain round holes up to 5" diameter or 6" x 6" square holes in 1/8" mild steel.

Turrets: 52" diameter, with 12 to 32 stations on 42" centers; 6 R.P.M.

Index Pins: Hardened and ground sliding in square seats.

Frame: Semi-steel casting; all bearings integral and bronze bushed.

Crankshaft: Eccentric type of massive construction.

Gearing: Steel with driving pinion cut solid on drive shaft.

Clutch: Jaw type with renewable faces.

Standard Stroke: 1 3/8"; can be varied to suit.

Strokes: 100 per min.

Write for bulletin giving complete and detailed specifications of this modern machine.

Wiedemann Machine Company

1801-31 SEDGLEY AVENUE PHILADELPHIA, PA.

MESTA
HEAVY DUTY MACHINE TOOLS

Table Type Planers

Pit Type Planers

Post Type Planers

Roll Grinders

Turning Lathes

Boring Lathes

Combination Boring and Turning Lathes

Trepanning Lathes

Roll Lathes

Boring Mills

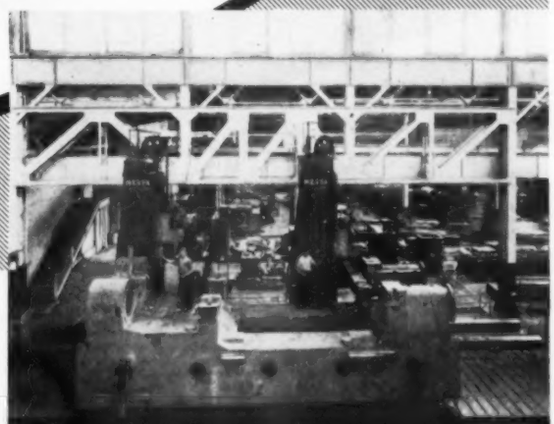
Draw-Cut Shapers

Saws

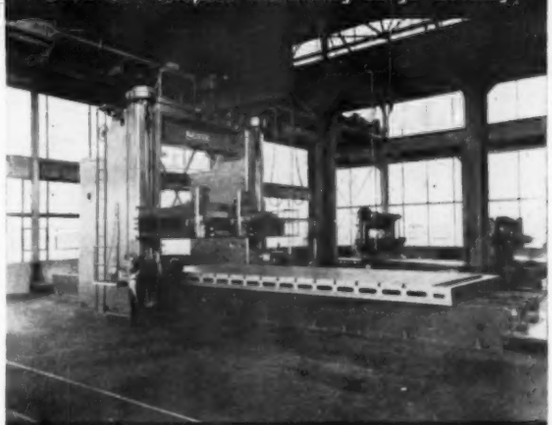
Gear Planers

Gear Hobbing Machines

Combination Shaping, Boring and Milling Machines



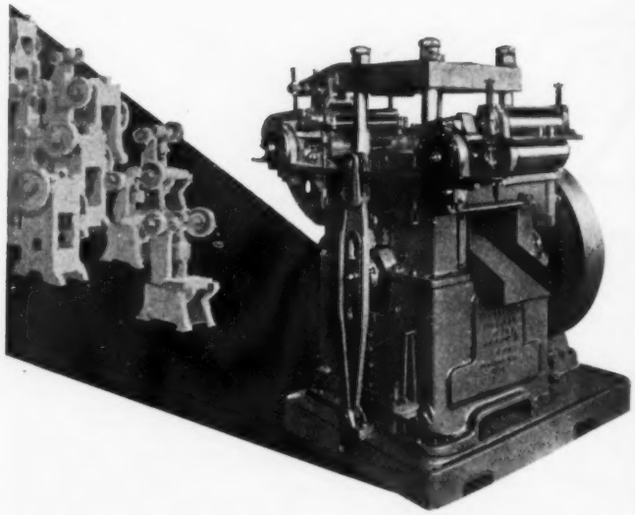
Draw-Cut Shapers Machining Large Casting



Heavy Duty Planer

Horizontal Boring Mill

MESTA MACHINE COMPANY • PITTSBURGH, PA.



One of these MODERN stamping machines replaces 5 to 10 conventional presses

—produces COMPLETED parts at every stroke.

—produces to precision previously thought unobtainable.

—saves 60% to 90% of stamping cost.

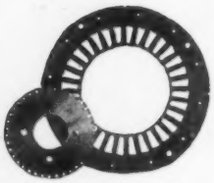
—same production with 50% to 90% less factory space.

—performs ALL operations combined in one process: blanking, piercing, forming, drawing, coining, extruding.

HENRY & WRIGHT DIEING MACHINES

Motor base produced complete at each stroke from 16 gauge cold rolled steel. Dimensions: 6¾x5x1¼".

Belt link for Vickers type machine gun, produced 100 complete per minute.



Motor stator and rotor laminations produced simultaneously from same strip of .018" silicon steel.

For All Industrial and Munitions Stampings

Dieing machines are producing an endless variety of stamped parts throughout industry and in munitions plants. Speeds up to 600 strokes per minute. Accuracy of product obtainable to .0002" limits. Capacities: 10 tons to 300 tons.

Request Catalogs Describing

DIEING MACHINES—STEEL PRESSES
ROLL STRAIGHTENERS—STOCK REELS
SENSITIVE DRILLING MACHINES

HENRY & WRIGHT MFG. CO.

HARTFORD, CONN., U. S. A.

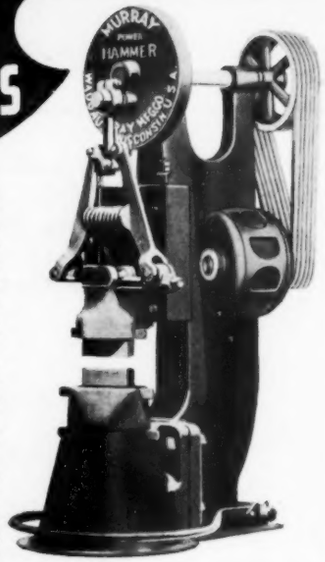
FAVORITE *IN NAME* FAVORITE *IN FACT*

This wrench has everything. Convenient ratchet action and positive grip on nut lets you pack real power in narrow places. Because head fits snugly over the nut, the head can't "chew" the nut. Reverse action by simply turning a pawl. Open head permits use over long studs. Three size handles . . . each takes five different heads . . . each head fits two different size nuts. Write for circular and prices.

GREENE, TWEED *FAVORITE* RATCHET WRENCH

GREENE, TWEED & CO., 101 Park Ave., New York, N. Y.

POWER DRIVEN FORGE HAMMERS



Made in 5 sizes—25 lb to 500 lb ram (illustrated here is 250 lb ram). Adaptable to a wide range of work, light or heavy. An ideal piece of modern equipment for maintenance as well as production work. Adjustment for different thicknesses of dies and material is provided — an outstanding Murray feature. Extremely powerful, yet simple in design, and so Flexible in operation Murray Power Driven Forge Hammers can be operated under perfect control, with little effort. Stability is built into them, and this means longer life and less maintenance cost. The ram design is a special feature. Ram is free from any obstruction thereby assuring full vision of the work, which makes possible use of longer guide. Write for details, and ask us about our repair and parts service.

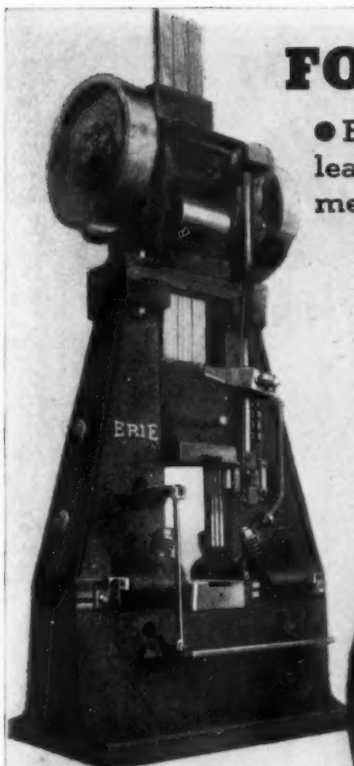
D. J. MURRAY MFG. CO.

WAUSAU, WISCONSIN

Established in 1883 *Offices in Principal Cities*

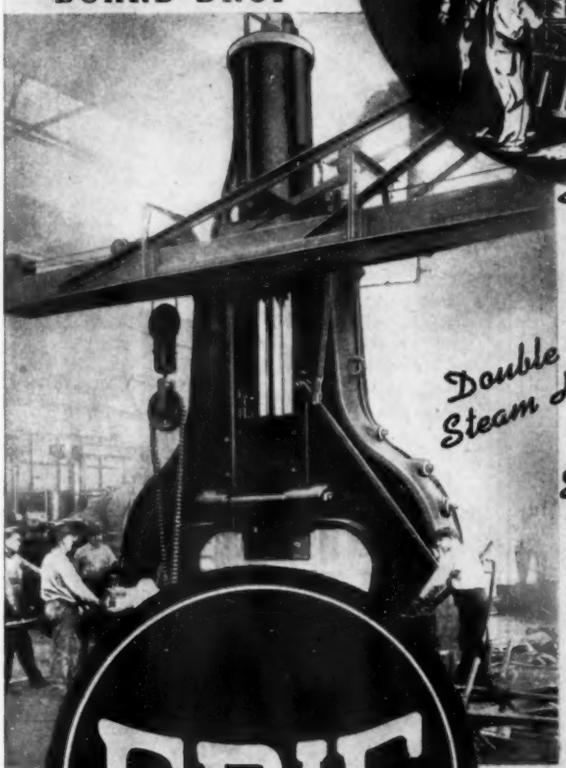
FOR *Better* FORGINGS!

● Erie Hammers are the choice of the world's leading forge shops . . . Steam Drop Hammers up to 75,000 lbs. Board Drop Hammers up to 10,000 lbs. Forging Hammers—Single Frame, Double Frame, Pneumatic in *all* required sizes . . . and Trimming Presses. Get your copy of the Erie Foundry Company Composite catalog.



BOARD DROP

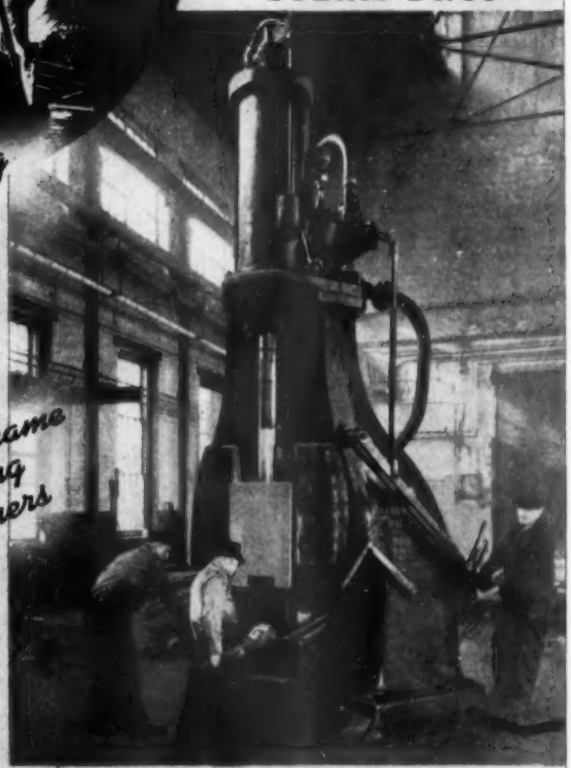
STEAM DROP



Trimming Presses

Double Frame Steam Hammers

Single Frame Forging Hammers



ERIE

ERIE FOUNDRY CO.

ERIE, PENNSYLVANIA, U. S. A.

DETROIT 335 Curtis Bldg. CHICAGO 549 Washington Blvd INDIANAPOLIS 335 Postal Station Bldg.

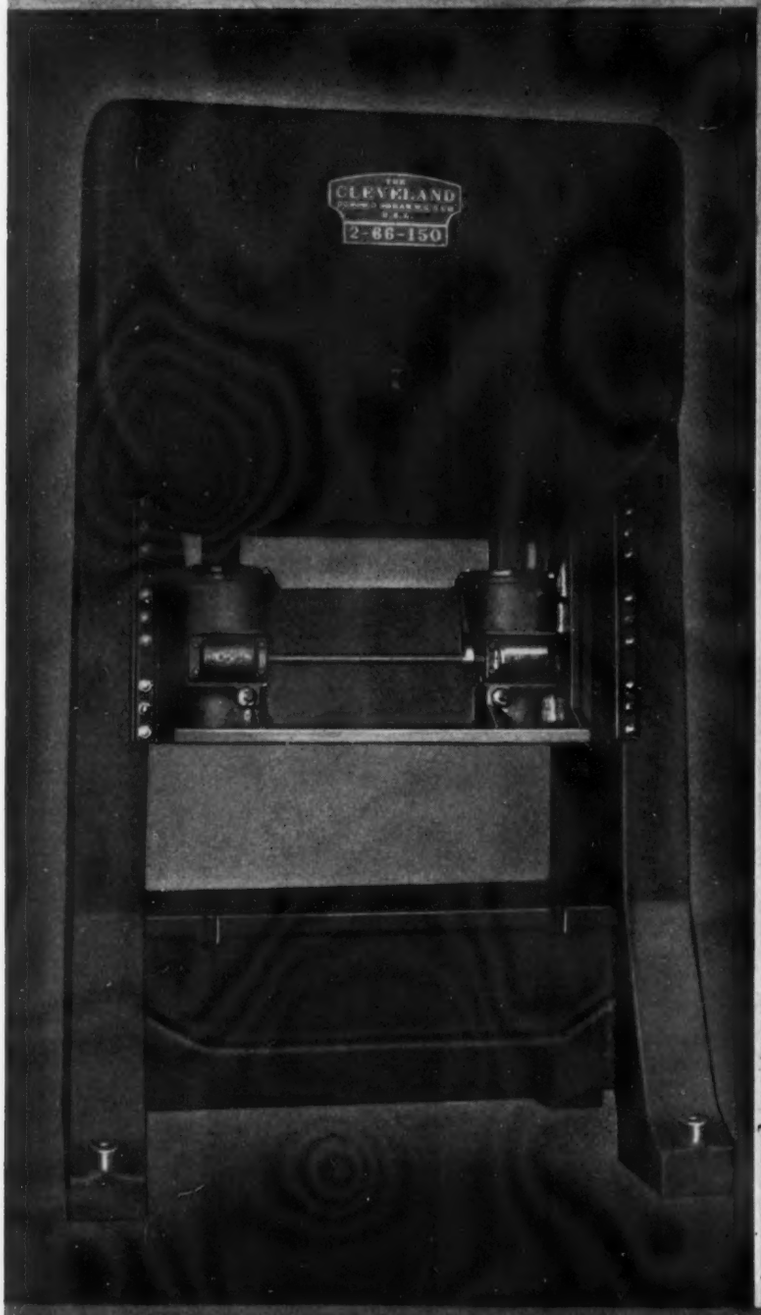
FRANCE Fenwick, S. A CANADA John Bertram & Sons Co., Ltd. ENGLAND Burton, Griffiths & Co., Ltd.

ERIE BUILDS *Dependable* HAMMERS

CONSIDER THE MANY ADVANTAGES

Modern Cleveland

POWER PRESSES CAN GIVE YOU



Typical of the MODERN series of Cleveland Single Point, Two Point and Four Point Presses, this Cleveland Two Point Press, which has a capacity of 150 tons, is designed for speed, accuracy and economy of operation.

The Press is symmetrical front and back, the gearing and drive unit being located in the box type crown, thereby eliminating all overhanging brackets and other projections and reducing the required floor space to a minimum.

Sleeve type adjustment is provided for the slide, which is air counterbalanced and the Press is equipped with an electrically controlled, hydraulically operated friction clutch and brake—pneumatically operated friction clutch is optional.

Cleveland Single Point, Two Point and Four Point Presses can be furnished in sizes and capacities to suit requirements —write for further details.

THE CLEVELAND PUNCH & SHEAR WORKS CO. . . *Cleveland, Ohio*

"Limiting Foreign Machinery Sales"

•

An Expression of Policy

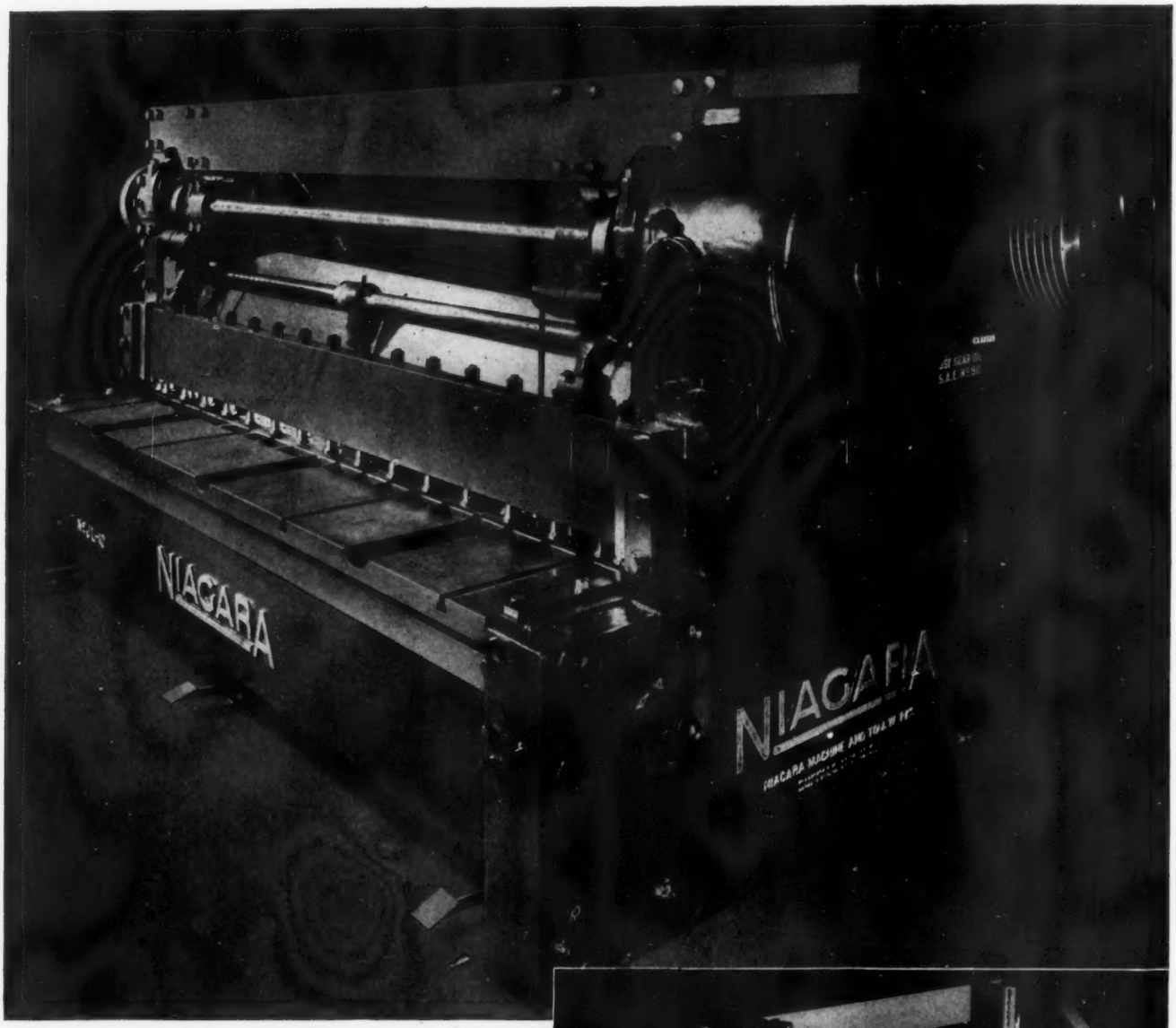
•

RECENTLY war orders have sharply increased foreign sales and shipments of Machine Tools for the United States as a whole, resulting in an acute shortage for domestic needs of many types of machine tools. Today better than half of total machine tool production is going abroad.

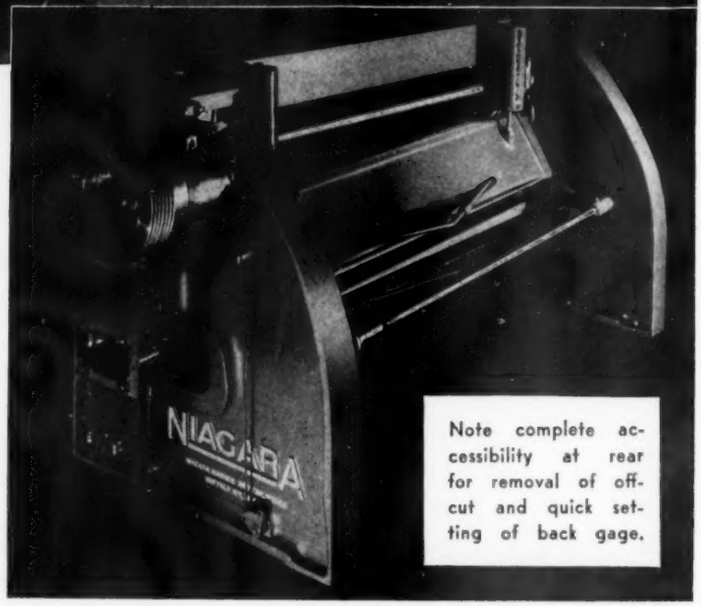
It is the belief of the management of Colonial Broach Company that United States requirements should come first, and it has—and will continue, as long as domestic demand continues—to support that belief by limiting export sales to the normal percentage previously absorbed by foreign countries.

•

COLONIAL BROACH COMPANY • DETROIT

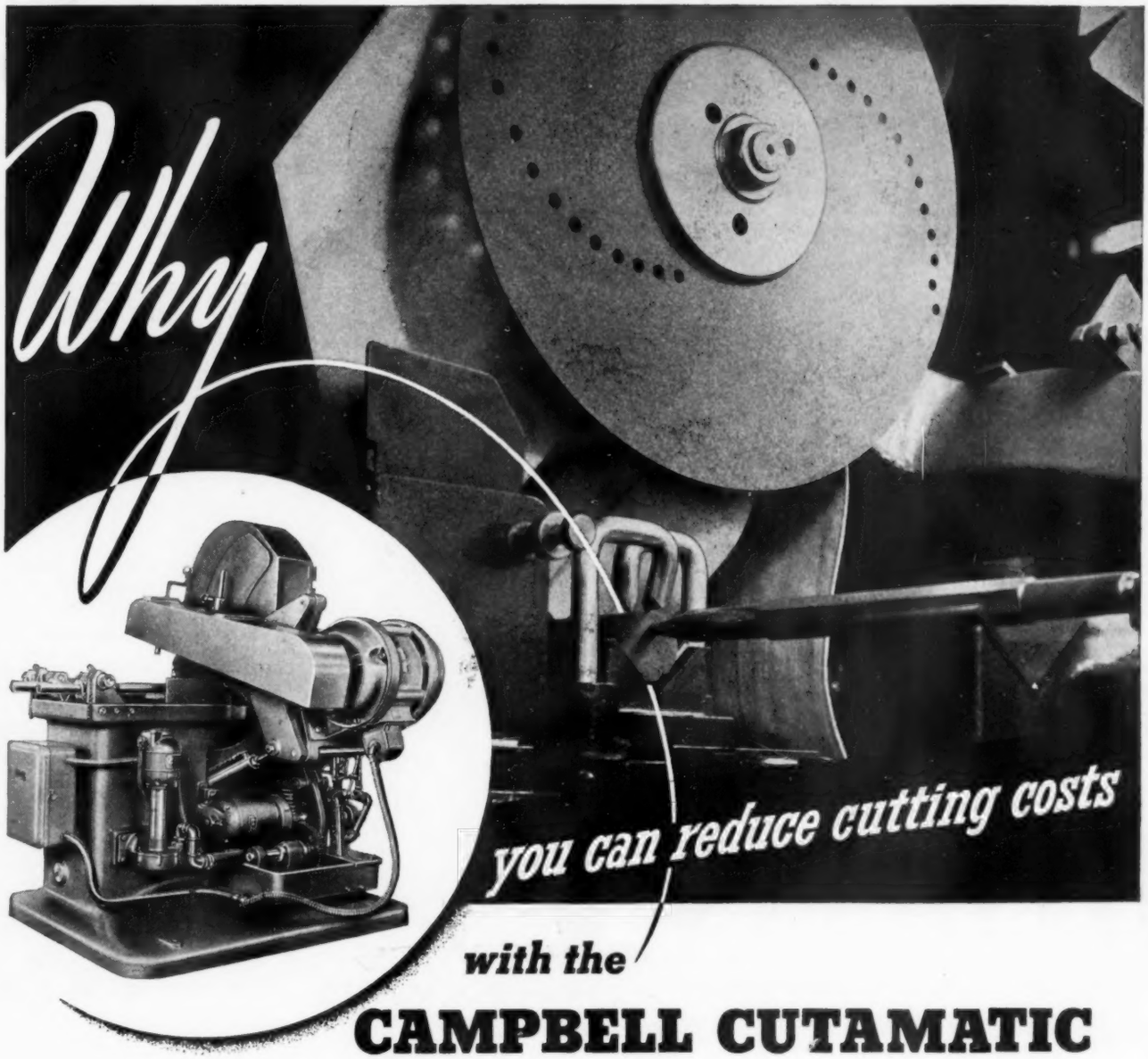


ILLUSTRATING latest type Niagara High Production Power Squaring Shears being used for squaring and slitting steel sheets in America's foremost industries including aviation, automotive, electrical equipment plants, steel warehouses, steel mills, railroad shops and other plants. More working strokes per hour are the result of convenient arrangement for handling sheets . . . accessible control . . . instant acting 14-point engagement sleeve clutch with built-in single stroke mechanism . . . smooth acting toggle operated holddown with individual pressure feet for varying lengths of sheets . . . triangular section cross head assuring rigid knife support for accurate cutting . . . clutch and drive gear mounted on antifriction bearings and enclosed in oiltight case for long life and low maintenance cost . . . new self-measuring ball-bearing parallel back gage providing quick operation and micrometer accuracy.



Note complete accessibility at rear for removal of offcut and quick setting of back gage.

Niagara Power Squaring Shears are built with capacities up to ¾ inch and all cutting lengths. Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. Branches: Cleveland, Detroit, New York.



● You can reduce cutting costs with a **Campbell Cutamatic** because the machine employs sound, proved cutting principles in a very efficient way—also because it has many features that save the operator's time.

That is why you can cut through tough metals and other materials of large section at the rate of a square inch each 12 seconds.

That is why cut surfaces are so smooth that finishing operations are usually not required. That is why the material is in no danger of being burned or case-hardened.

Write for the booklet, *"Design for Cutting Costs."* You may find it valuable.

BUY ACCO QUALITY *in Campbell Cutting Machines; Wright Hoists, Cranes and Trolleys; Page Welding Electrodes; American Chains; Tru-Lay Preformed Wire Rope; Reading-Pratt & Cady Valves; Page Wire Fence.*

ANDREW C. CAMPBELL DIVISION • BRIDGEPORT, CONNECTICUT

DESIGNERS AND BUILDERS OF SPECIAL MACHINERY

AMERICAN CHAIN & CABLE COMPANY, Inc.

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WRIGHT MANUFACTURING DIVISION

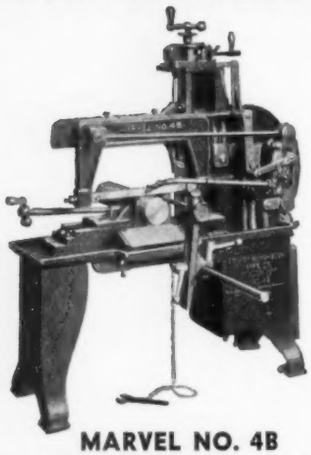
In Canada:
DOMINION CHAIN COMPANY, LTD.
In England:
BRITISH WIRE PRODUCTS, LTD.
THE PARSONS CHAIN COMPANY, LTD.

Yes Sir..

MARVEL SAWING MACHINES

General Purpose Saws
No. 1 (Capacity 4″ x 4″)
No. 2 (Capacity 8″ x 8″)
Light High Speed Saw
No. 4B (Capacity 6″ x 6″)
Heavy-Duty High Speed Saws
No. 6 (Capacity 6″ x 6″)
No. 9 (Capacity 10″ x 10″)
Automatic Production Saws
No. 6A (Capacity 6″ x 6″)
No. 9A (Capacity 10″ x 10″)
Metal Band Saw
No. 8 (Capacity 18″ x 18″)
Giant Hydraulic Hack Saw
No. 18 (Capacity 18″ x 18″)

MARVEL SAWS



MARVEL NO. 4B

A Real High Speed Saw at an ordinary saw price

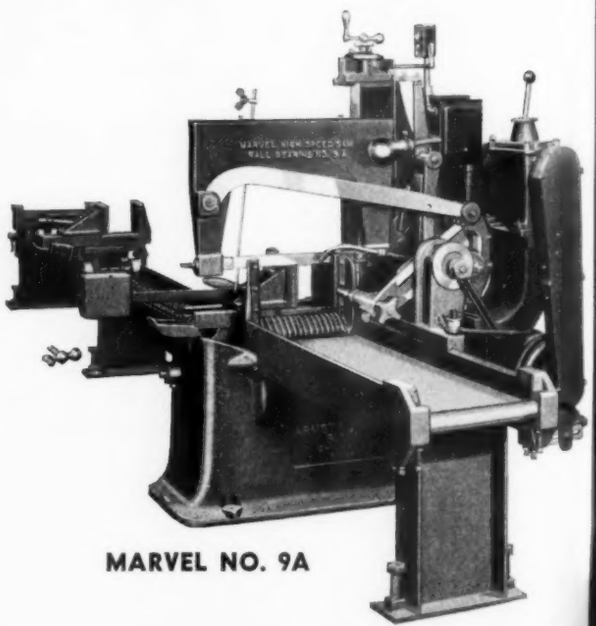
MARVEL 4B, Capacity 6"x6". This moderate priced high speed sawing machine is the ideal saw for general run-of-the-shop work. With quick return on non-cutting stroke, it is exceedingly fast—*so fast it will out-cut any other saw, regardless of type, in its price class.* Features include: Both Power Friction Screw Feed and convenient Hand Screw Feed; Reliable plunger type Coolant Pump; anti-friction ball bearings in saw frame; quick-action vise; automatic stop; Optional: belt or motor drive, single or multi-speed; open-leg or cabinet base.

Automatic Production Cutting-Off

No other sawing machine or cutting-off method can equal a heavy duty MARVEL Production Saw in number of pieces per hour or low cost per piece, for cutting-off bar stock. Equipped with automatic bar push-up, sturdily built with every moving part rolling on ball bearings and incredibly fast with shaper-like crank action, these saws operate at top capacity hour after hour. They require no more attention than an automatic screw machine. If you are cutting off identical pieces from bar stock, this is the saw for you.

Although fully automatic production machine tools, they are also exceedingly fast and accurate general purpose hack saws, for at any point in a run, the bar push-up can be disengaged, a miscellaneous cut made, and production work resumed in a few seconds.

MARVEL Production Saws come in two sizes: MARVEL 6A, Capacity 6" x 6"; MARVEL 9A, Capacity 10" x 10".



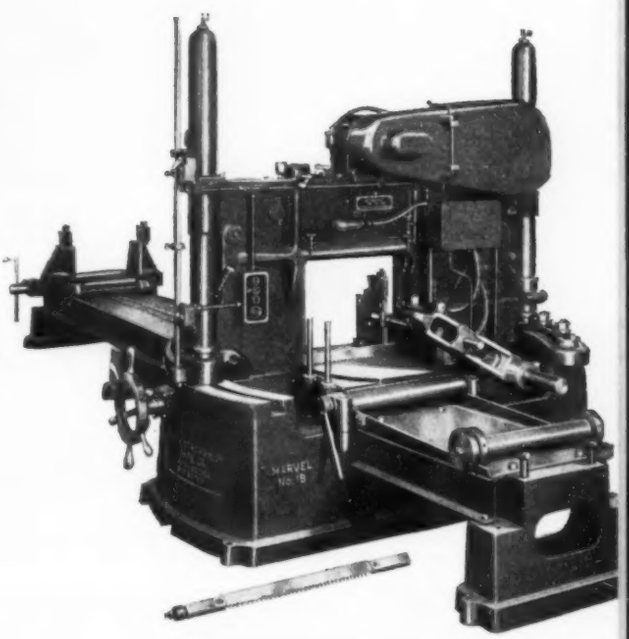
MARVEL NO. 9A

...we have sure reduced our cutting costs with MARVEL SAWS

★ The above is typical of the expressions heard in metal working plants after an installation of MARVEL Sawing Machines is made. Likewise, they shout words of praise for MARVEL High-Speed-Edge Hack Saw Blades. Well, it's no wonder they speak so well of MARVEL—MARVEL delivers in terms of profits. You would soon join up with the long, long list of MARVEL users in saying "MARVEL is tops" once you put MARVEL to work.

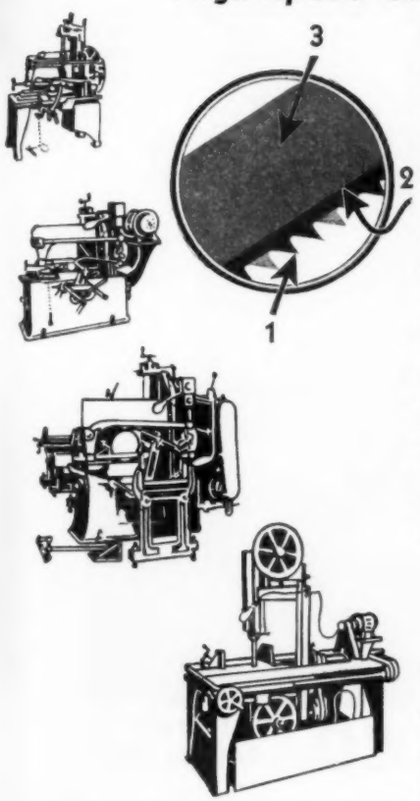
There's a complete line of MARVEL metal-cutting power saws, ranging from small low-priced, dry-cutting shop saws to a giant hydraulic hack saw designed to efficiently cut the largest sizes and the toughest alloy steels.

Why don't you find out all about MARVEL—get the important facts—see why MARVEL offers the modern, money-saving way of cutting metal?



MARVEL NO. 18

High Speed and positively unbreakable



Tough, shatterproof, at all speeds, feed pressures and tensions, positively UNBREAKABLE under all operating conditions, MARVEL blades will out-cut and out-last any other blades. They will give you continuous operation, hour after hour until the edge is gone. Increase the speed, increase the feed pressure up to the machine capacity with SAFETY! When you buy MARVEL blades you buy a blade with an 18% Tungsten High Speed Steel Cutting edge welded by patented process to a tough alloy steel body . . . a blade that does not have to be "babied". Try a box now. They will solve all your blade problems.

(1) Genuine 18% High Speed Tungsten steel cutting edge

(2) Integrally fused by electric weld to

(3) Tough alloy back; positively unbreakable

A Giant in Ability

In capacity, ruggedness, power, proportions—this MARVEL No. 18 is truly a giant. Swing an 18" x 18" billet or bar of the toughest steel into the MARVEL No. 18 and under its smooth hydraulic feed, its chip-clearing roll-stroke action, it will cut it down with unbelievable ease and speed.

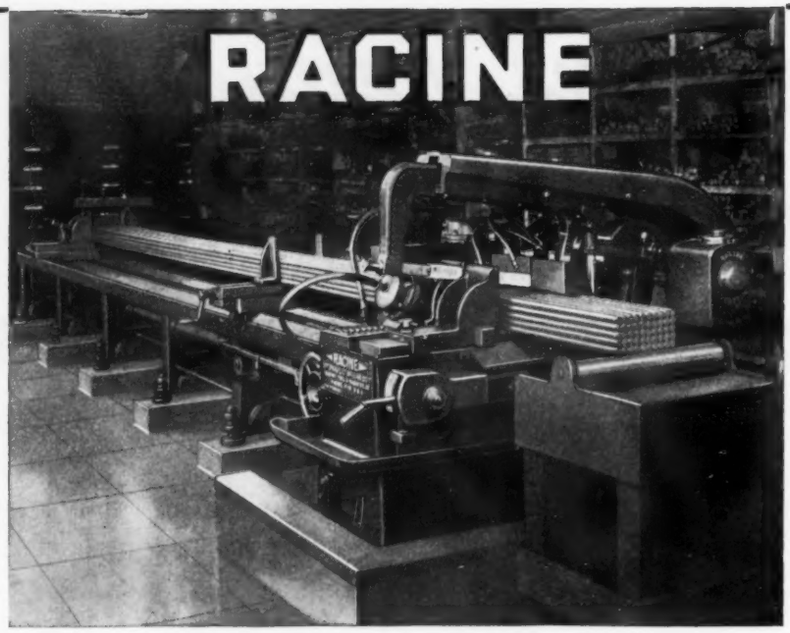
This saw takes "all comers" and will stand up to continuous operation on the heaviest work. Armoured, with all moving parts protected, it is not endangered by the thumps and knocks incidental to handling large work. It is a tough, powerful unit, yet handles like a baby with its trouble-free, low-pressure hydraulic feed, and quick traverse. For large sizes and tough steel it is unequalled in speed, accuracy, and economy.

• *Submit your cutting problems to your local MARVEL Engineer*

Take advantage of the MARVEL Free Technical Service. At your request a competent MARVEL Engineer will call at your shop or plant, study your metal sawing problems, and make recommendations for increasing your metal cutting efficiency. No obligation, of course.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*

5700 Bloomingdale Ave., Chicago, U. S. A. Eastern Sales: 199 Lafayette St., N. Y.



Right—Fast production at Flannery Bolt Company, Bridgeville, Pennsylvania. A RACINE Heavy Duty Machine cutting fifty 1" bars at once, to uniform lengths in fully automatic cycle.

RACINE SAWS

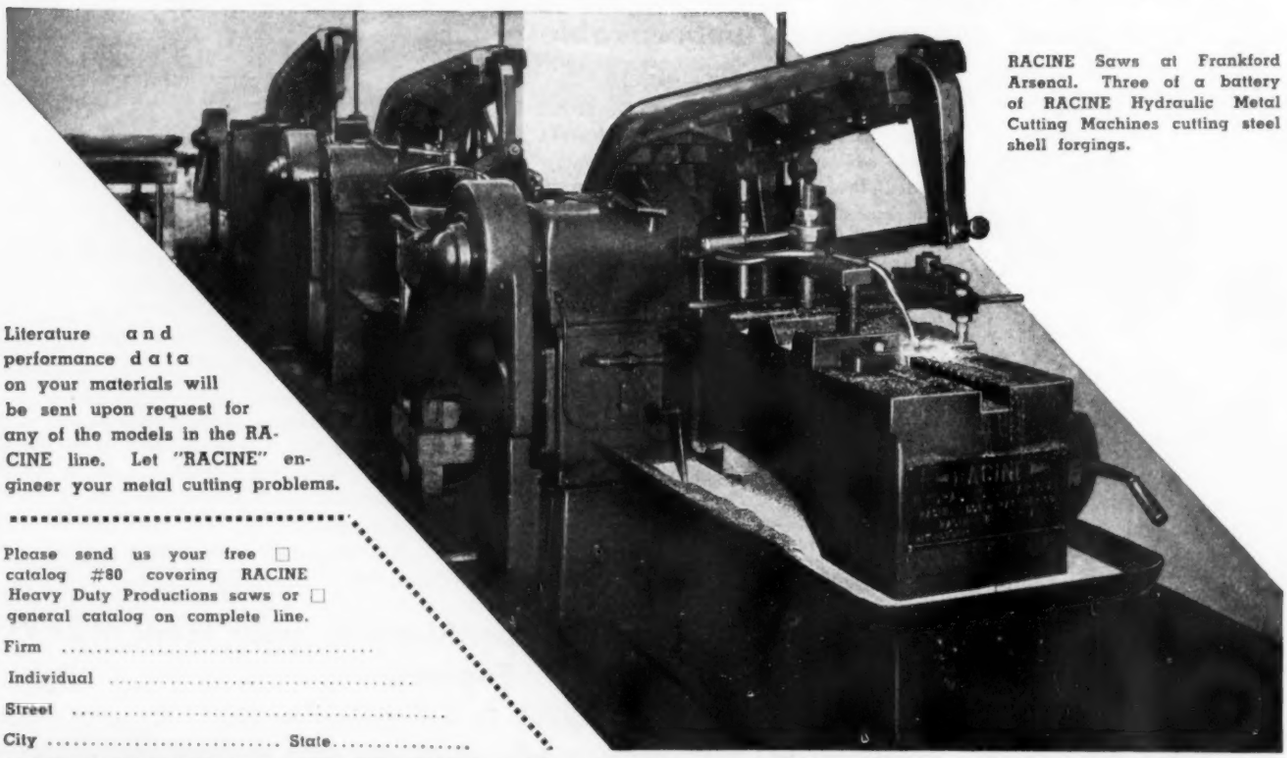
MODERN — In Speed

MODERN — In Hydraulic Simplicity

MODERN — In Accuracy — Economy

In arsenals, in battleships and cruisers, in steel mills, in aircraft plants, in all the heavy industries, RACINE Metal Cutting Machines are used for cutting bars, billets, structural steel shapes, die blocks, etc. Hydraulic feeds and control give smooth, quiet performance and the correct speeds for cutting all types of steel. RACINE Heavy Duty Machines are used to get the fastest sustained production with the longest blade life, wherever metal cutting jobs are tough.

RACINE Heavy Duty Hydraulic Models are available in sizes 10x10 to 14x20. Other RACINE saws in Hydraulic Feed, Screw Feed, and Gvarity Feed Types—6x6 to 9x9—are adaptable to every purpose from general shop work to full automatic operation.



RACINE Saws at Frankford Arsenal. Three of a battery of RACINE Hydraulic Metal Cutting Machines cutting steel shell forgings.

Literature and performance data on your materials will be sent upon request for any of the models in the RACINE line. Let "RACINE" engineer your metal cutting problems.

Please send us your free ☐ catalog #80 covering RACINE Heavy Duty Productions saws or ☐ general catalog on complete line.

Firm .....

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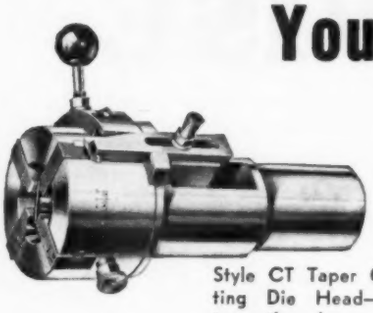
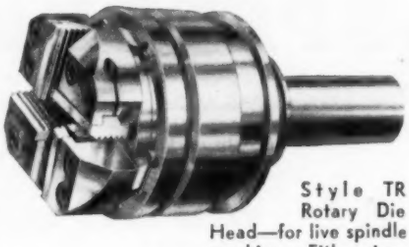
City ..... State.....

RACINE TOOL & MACHINE CO. 1751 STATE ST. RACINE, WIS.

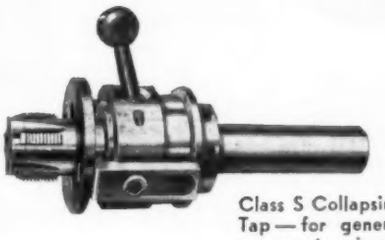
You Can't Cut Today's Threads with Old, Obsolete Tools



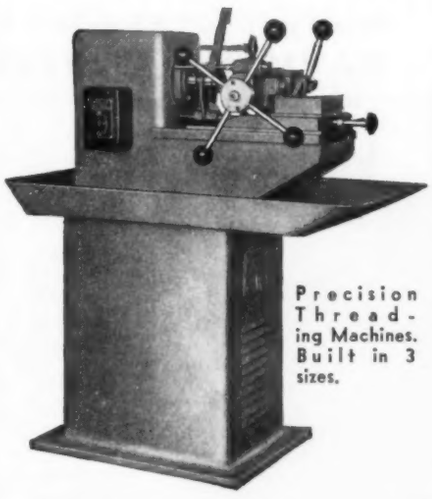
Style CT Taper Cutting Die Head—for taper threads.



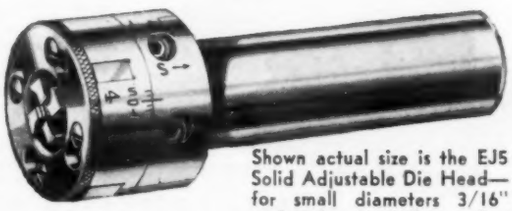
Style TR Rotary Die Head—for live spindle machines. Either tangent or circular chasers may be used.



Class S Collapsing Tap—for general purpose tapping.



Precision Threading Machines. Built in 3 sizes.



Shown actual size is the EJ5 Solid Adjustable Die Head—for small diameters 3/16" and under, in pitches as fine as 100.

With the tough alloy steels, the close thread limits demanded today, you can't cut accurate threads with old, obsolete tools.

You need tools designed for today's needs. You need chasers hardened, tempered and ground for today's materials.

You can get such tools, and such chasers at Geometric.

At the left are shown a few of the more recent Geometric tools and machines, all designed to meet the threading needs of today. There are many others not so shown.

Catalogs or specific quotations gladly furnished on request.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN.

Specialists in Threading Tools since 1895.

Equip Your Engine Lathes with Turret Lathe Advantages

INSTALL

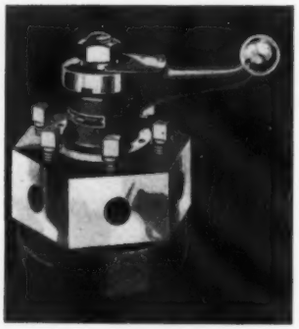
McCROSKY TURRETS

IF you are planning to use an engine lathe for a production job requiring two or more operations, investigate the time-saving advantages of equipping it with a McCrosky Turret.

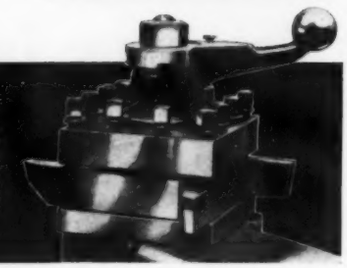
A McCrosky Turret will enable the operator to set up all tools before he starts production. As each successive tool is needed, he can index it quickly and accurately into cutting position without stopping his machine (all McCrosky Turrets have 12 indexing positions).

You can be sure McCrosky Turrets are ruggedly built to stand up under high production pressure.

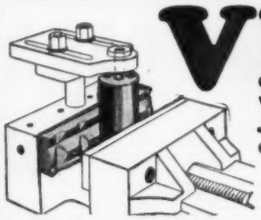
Ask for McCrosky Bulletin 15-E giving full details of McCrosky 4-Way and Hexagon Turrets



McCROSKY TOOL CORP.
MEADVILLE • PA.



McCROSKY TURRET TOOL POSTS
Speed up Lathe production



VISE

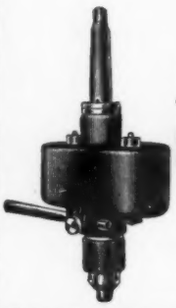
For DRILL PRESS

With and Without Jig Attachments.
Jaws 6", 9" and 12" Long
Often used on Miller, Shaper, Planer

Fig. 3. V-Jaw for Round Work

Attachments mean much drilling — small Jig cost.

Fig. 2 Without Jig Attachments



DRILL

SPEEDER

or High Speed Drilling Attachment
Drives Small Drills up to Proper Speed
INCREASE THE SPEED 3 TIMES
Suits Straight or Taper Shank Drills up to ½" with Speeds to 3,000 R.P.M. For use in Drillers from 20" to largest Radial.

KNURL HOLDER

Swivel Lugs

Shank made to suit turret

For Turret Lathes
Operates like screw Die
Adjustable to any size within its capacity.

TWO SIZES--TWO STYLES
Straight Cut Knurls in Swivel Lugs Produce all Standard Knurling.

Send for Circulars

THE GRAHAM MFG. CO., 73 Willard Ave., PROVIDENCE, R. I.

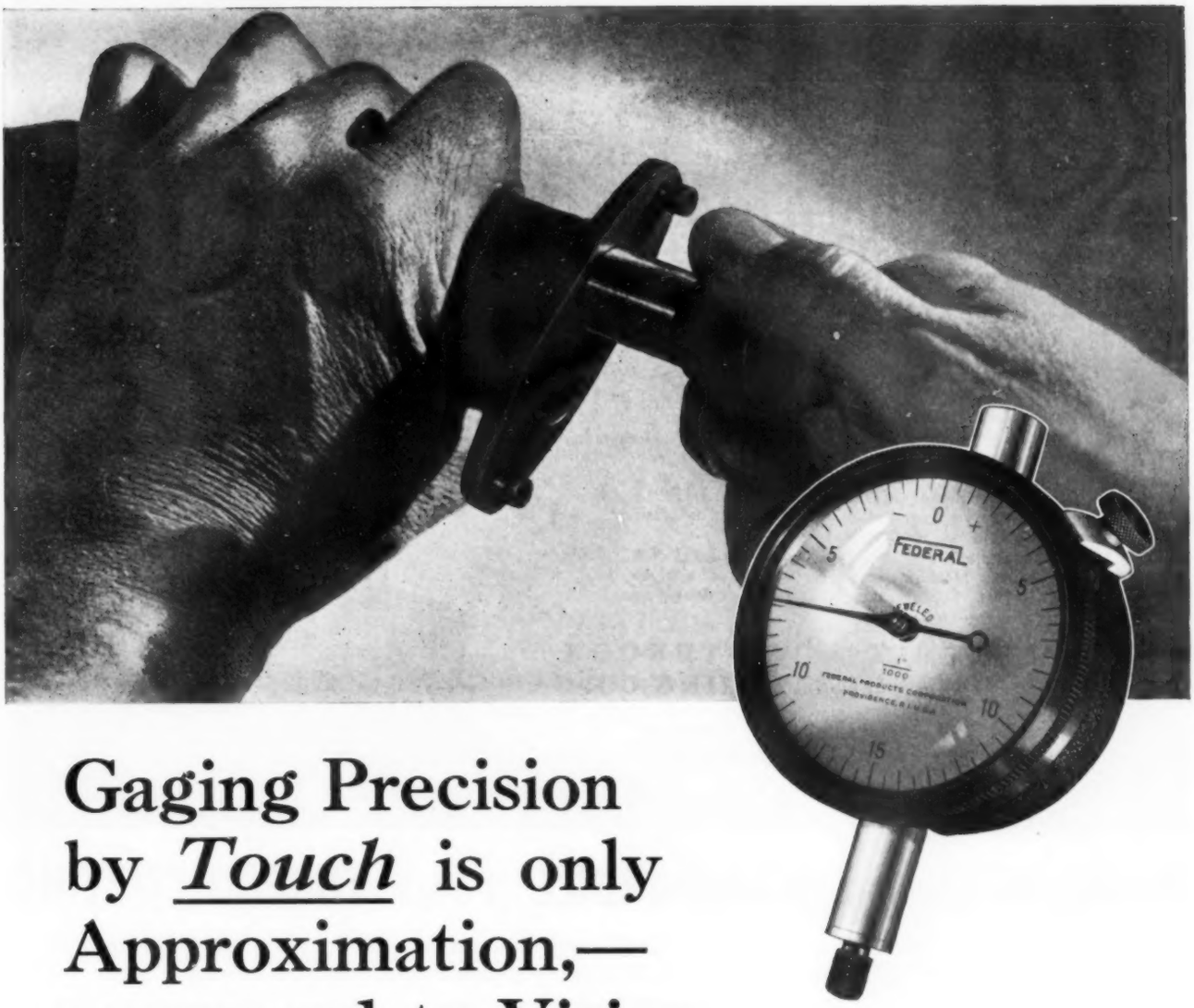
Quick set-up and fast cutting mean *big savings* on one or many pieces—with DAVIS KEYSEATERS

Accurate, time saving work at low cost is assured by handling keyseating on a Davis. A saw or broaching tool with several teeth cutting simultaneously and accurately guided, is fastened to a cross head which gives it a reciprocating motion. Adjustment to center cutter with work is provided. Work can be set up quickly and easily.

Write for complete, detailed information on Davis Keyseaters — available in sizes for cutting straight or taper keyways from 1/16" to 1¼" wide.

Table may be inclined in either direction from horizontal for cutting taper keyways.

DAVIS KEYSEATER CO.
403 EXCHANGE ST.,
ROCHESTER, NEW YORK



Gaging Precision by *Touch* is only Approximation,— compared to Vision

The sense of *feeling* or of *touch* as applied to fixed gages when used to determine the accuracy of specified sizes on machine parts, depends upon the sensitivity of the inspector and varies with each individual.

But, a visible indicating hand, moving over widely spaced dial graduations, is something which can be seen with the same degree of accuracy by *anybody.*

This fact is one of the strongest reasons for using Dial Indicators even for comparatively large tolerances. Send for catalog.

FEDERAL PRODUCTS CORP., 1144 EDDY ST., PROVIDENCE, R. I.

FEDERAL

PRECISION MEASURING INSTRUMENTS

Chicago • Cleveland • Detroit • Hartford • Muncie
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Chuck Manufacturer Proves Economy of Noblewest Precision Marking

500% PRODUCTION INCREASE

Jacobs Manufacturing Company, makers of chucks, found that Noble & Westbrook's rapid production equipment increased their marking production 500%. Quality too, was improved . . . impressions becoming sharper and clearer.

Noble & Westbrook precision equipment offers you many advantages for faster, better marking: Its rolling process combines higher speeds with accuracy. Two or more operations can often be combined in one. Marking dies are adjustable. Automatic safety devices and registration of numbering or marking. Automatic unloading.

Investigate the money-saving possibilities of Noble & Westbrook Precision Marking equipment. Let us analyze your marking problems, suggest ways to improve quality, speed production No obligation.

NOBLE & WESTBROOK MANUFACTURING CO.

Specialists in rapid, precision marking equipment

17 WESTBROOK STREET
EAST HARTFORD, CONN.

NOBLEWEST IMPROVED MARKING DEVICES

MODERNIZE *and* STANDARDIZE *your* THREAD CUTTING

In changing to H&G Insert Chaser Die Heads you release six to eight out of every ten dollars now tied up in chaser stock, thus making it possible to standardize on this more modern type die head without increasing your investment.

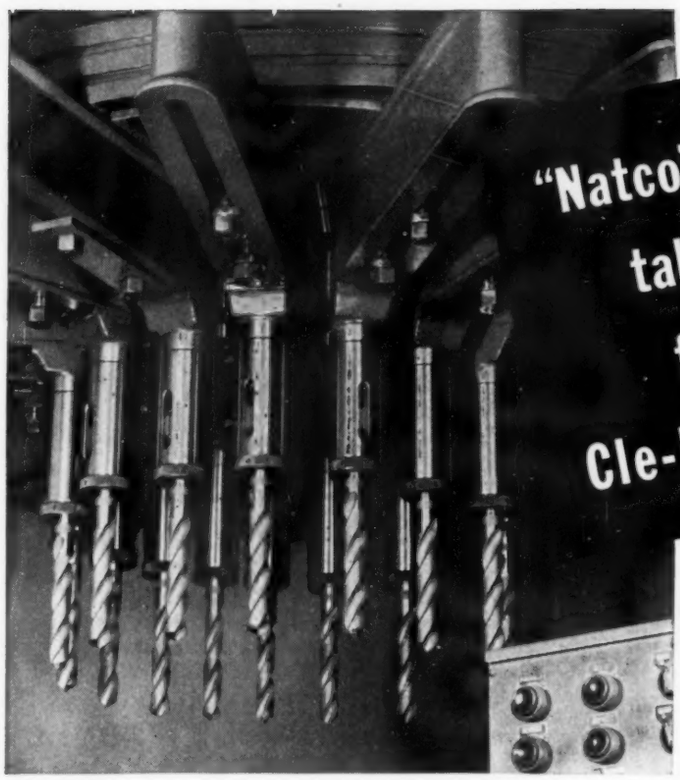
NEW BULLETIN No. 10

Send for this bulletin which illustrates the complete line and describes the unique advantages of

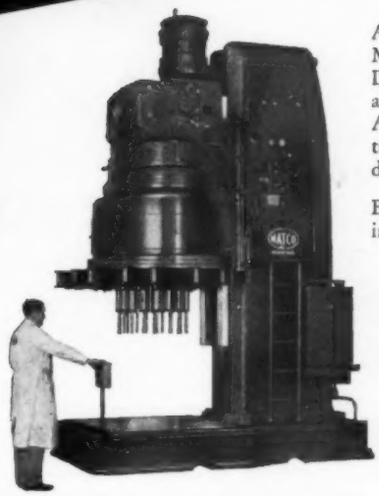
H&G

INSERT CHASER DIE HEADS

THE EASTERN MACHINE SCREW CORPORATION — 20-40 Barclay St., New Haven, Conn.



"Natco's" New Multiple Driller takes its first bow . . . fully equipped with Cle-Forge High-Speed Drills



At left, the new "Natco" Model 5DL, Heavy Duty Vertical Adjustable Multi-Driller. Approximately 16½ ft. tall; weighs 50,000 lbs.; driven by 40 HP motor.

Below: Smallest "Natco" in same series.

Sixteen 1¼" Cle-Forge High-Speed Drills were installed when the first of the National Automatic Tool Company's new Model 5DL Multi-Drillers was assembled on the erecting floor. These machines have a 36" round head, and drill at one operation a circle of 16 holes, each 1¼" to 1⅜".

Time-tried, reliable Cleveland Drills thus are serving *again* at the "christening" of modern, large-production drilling equipment.

And, whatever the destination of this particular machine, one may conservatively expect it will be operating "Cleveland" tools on the job—for independent surveys of purchases of drills by make, have repeatedly shown a substantial preference for "Cleveland" Drills and Reamers over other prominent brands.

If *you* aren't using "Cleveland" Tools now, we will gladly arrange an unbiased, competitive test against others, in your own materials, in your own plant. For complete information, please consult a "Cleveland" Representative or your present source of supply.

Body and cover of cast-iron steam exhaust head. Note 16-hole drilling in base. Cle-Forge High-Speed Drills used by builder for many years.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 654 HOWARD ST. SAN FRANCISCO
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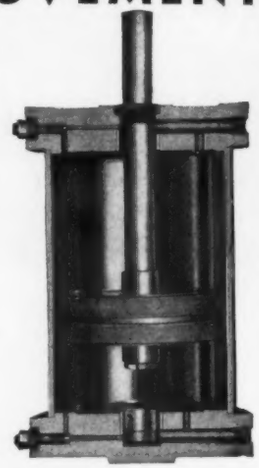
"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

for steady . . .
efficient performance . . .
in the operations of . . .

✓ POWER MOVEMENT

T-J Air Cylinders have hard chromium plated cylinder walls and piston rods. Packing life is prolonged and smooth rust proof surfaces for greater sealing efficiency are accomplished. **T-J Hydraulic Cylinders** have one piece pistons of greater width sealed with packings to reduce power loss due to slippage. There are standard styles and capacities to suit your requirements.



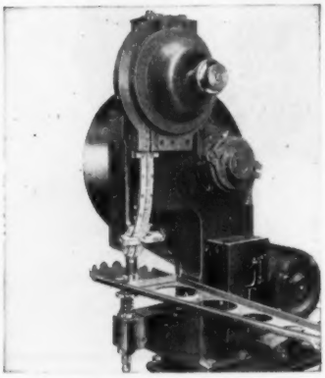
T-J AIR CYLINDER CUSHIONED AT BOTH ENDS

✓ MACHINE CONTROL

T-J Pneumatic Remote Control Valve Systems are designed for the automatic or semi-automatic control of presses, brakes, shears, indexing devices and special machines and equipment of all types. They secure maximum possible machine speeds while safeguarding workers. Send operating cycle requirements. Recommendations of suitable circuits will be submitted without obligation.

✓ SOLID RIVET SETTING

(automatic feed)



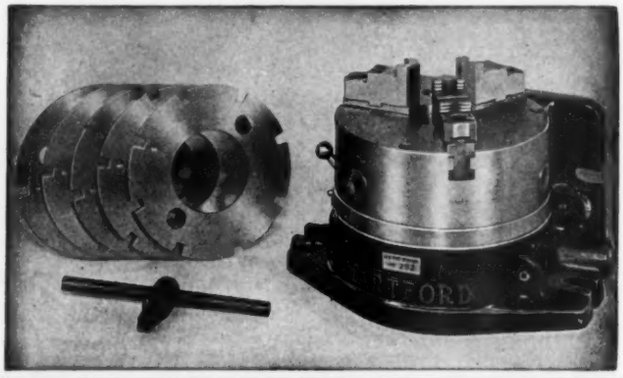
The **Rivitor** accomplishes the preferred type of joint and at production schedules. Controlled setting action is applied to effect the completely filled hole and a neat balanced head. No flashing occurs between pieces. The machines pay for themselves by making possible the substitution of solid rivets for the more expensive types.

—for particulars . . . call in our representative

Boston—General Machinery Corp. . . . Buffalo—R. C. Neal Co., Inc. . . . Cincinnati—Henry M. Wood Co. . . . Chicago—H. F. Wolnick Machinery Co. . . . Cleveland—S. G. Morris . . . Detroit—Harberkorn & Wood . . . Grand Rapids—Joseph Monahan . . . Hartford, Conn.—G. M. Pearse Jr. . . . Indianapolis—Henry G. Hoss . . . Milwaukee—J. M. Grimstad . . . Newark, N. J.—George M. Pearse . . . Philadelphia (Drexel Hill)—Walter A. Rankin . . . Pittsburgh—J. A. Bouslough . . . Rochester—R. C. Neal Co., Inc. . . . San Francisco—R. W. Conroy . . . Syracuse—R. C. Neal Co., Inc. . . . Canada—Geo. T. White Co. (Walkerville, Ont.) . . . Europe—Gaston E. Marbaix Ltd. (London) . . . or write

THE TOMKINS-JOHNSON CO.
615 N. Mechanic St. Jackson, Michigan

INVESTIGATE THE HARTFORD SUPER-SPACER



Increase the speed and accuracy of your indexing—on milling, drilling, slotting, grinding and planing operations — by using the HARTFORD SUPER-SPACER.

This modern device is a time and money saver in the tool rooms and on the production lines of many leading shops and is proving a practical way to get maximum production at minimum cost from present machine tools.

FOR FAST, ACCURATE, LOW-COST INDEXING

INVESTIGATE TODAY by sending for details.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

With* ULTRA-CHEX . . . *small shops can have* PRECISION LENGTH STANDARDS *at a price they can afford to pay

Keep your micrometers at gage block accuracy and avoid rejected work with ULTRA-CHEX—the *Precision Length Standards now available at reasonable price.*

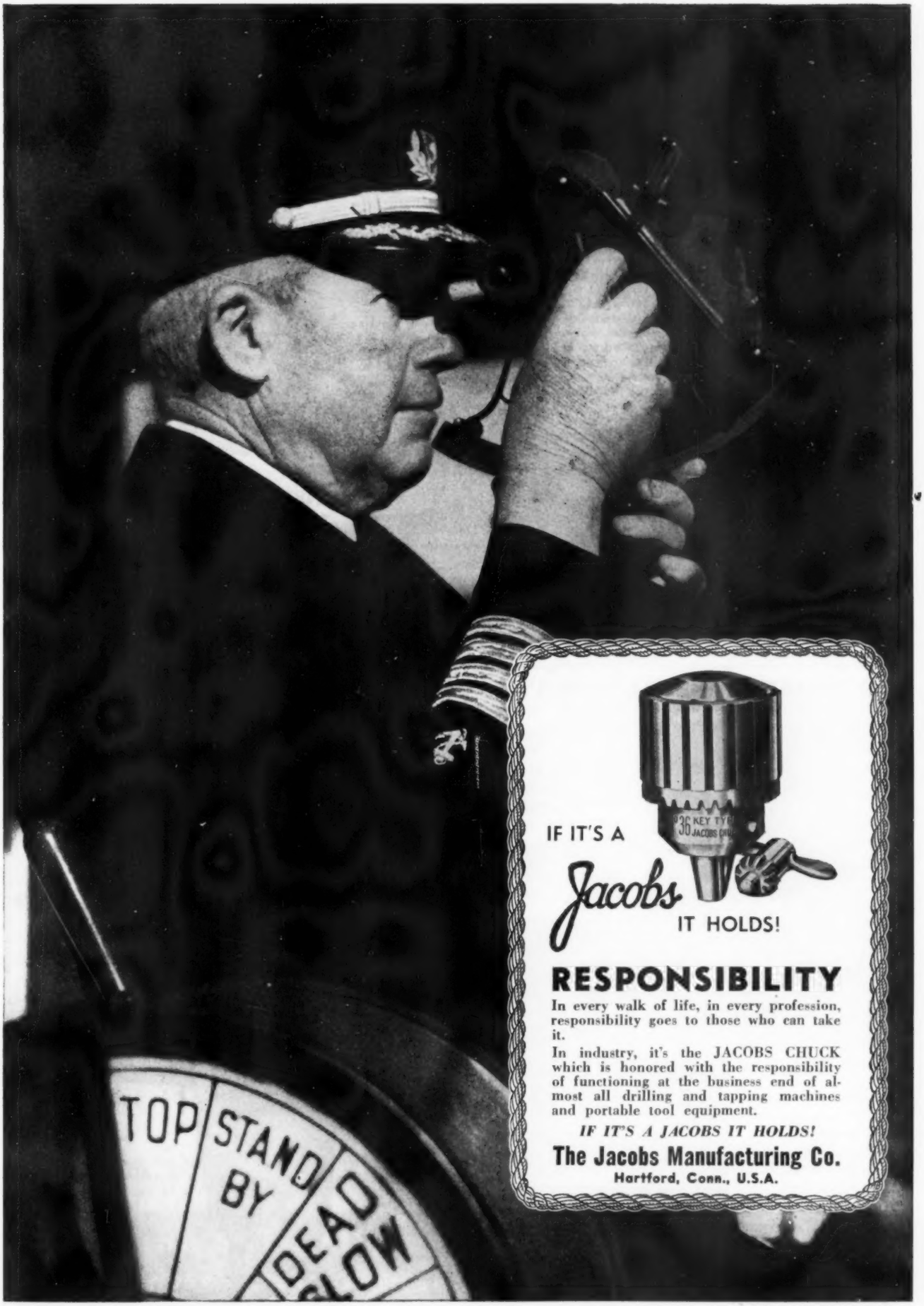
To compensate for errors in micrometers it is merely necessary to set your micrometer with the ULTRA-CHEX block or combination nearest the dimension required. Beyond that, you can be certain that the micrometer will be accurate within a few turns.

Micrometer anvils can be checked for parallelism by means of the ULTRA-CHEX Optical Parallel which is also available at a very reasonable price.

Ask for detailed information on ULTRA-CHEX and the many applications offered for maintaining precision standards.

Price $25.00 9 block set with optical flat. Dimensions .0625 - .100" - .125" .200" - .250" - .300" - .500" - 1" - 2"

GEORGE SCHERR CO.
124 Lafayette St., New York, N. Y.



IF IT'S A

Jacobs IT HOLDS!

RESPONSIBILITY

In every walk of life, in every profession, responsibility goes to those who can take it.

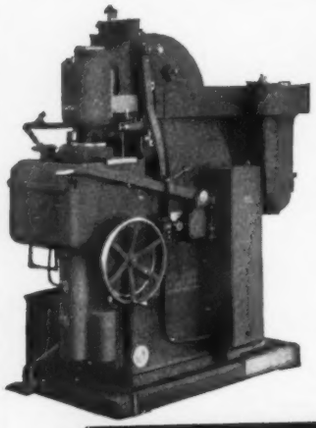
In industry, it's the JACOBS CHUCK which is honored with the responsibility of functioning at the business end of almost all drilling and tapping machines and portable tool equipment.

IF IT'S A JACOBS IT HOLDS!

The Jacobs Manufacturing Co.

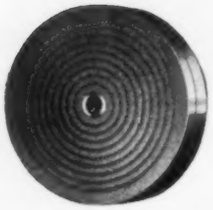
Hartford, Conn., U.S.A.

WALKER



IMPROVED ROTARY SURFACE GRINDER . . .

Lowering or raising wheel head automatically starts or stops the table and magnetizes or demagnetizes 12" magnetic chuck. Other features include wheel head locking device and adjustment of upper portion of column for grinding saws, cutters, etc., having hubs up to 6" diameter. Six table speeds are available and a foot brake facilitates quick stopping of table.



STANDARD ROTARY CHUCKS

6" to 36" DIAMETER

Style D (left) for thin, small work, as well as for general grinding. Style B (left) is ideal for work of average size and thickness. Four standard styles, all interchangeable.

MAGNETIC CHUCKS

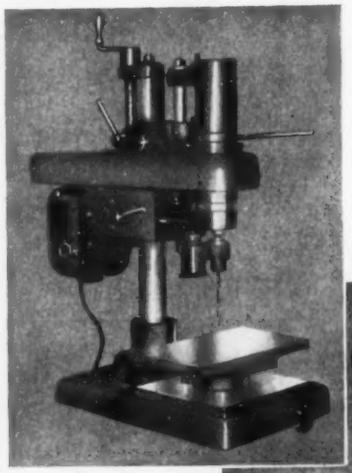
Left—No. 618 Standard Type Rectangular Magnetic Chuck. Available in sizes 4 x 8 to 30 x 96.

Ask for Circulars W4 covering Chucks and Demagnetizers and DB2 covering Surface Grinders

O. S. WALKER COMPANY., INC.
WORCESTER • MASS.

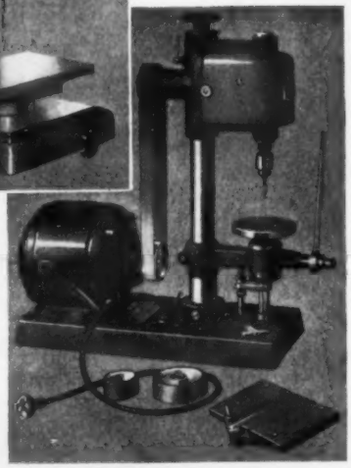
HAMILTON—MUEHLMATT

(The World's Standard for small hole drilling and tapping)



DRILLS
.004" to ¼"

Manufacturers producing aircraft parts, diesel engines, cameras, instruments, watches, tools and gages, and many other products find that Hamilton-Muehlmatt machines can be depended on to perform with the same "instrument precision" they are building into their own products.



TAPS
From smallest and finest to 3/16

A. Muehlmatt Division of
THE HAMILTON TOOL COMPANY
HAMILTON, OHIO

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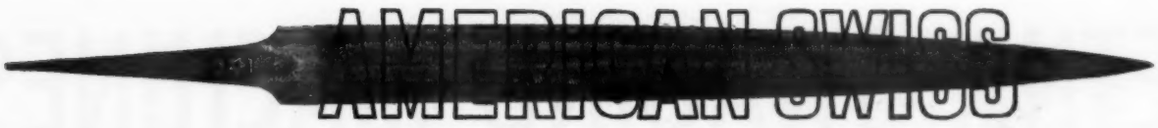
MULTIPLE HEADS

Super-Sensitive Fixed-Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD



SWISS PATTERN FILES

MADE IN U. S. A.

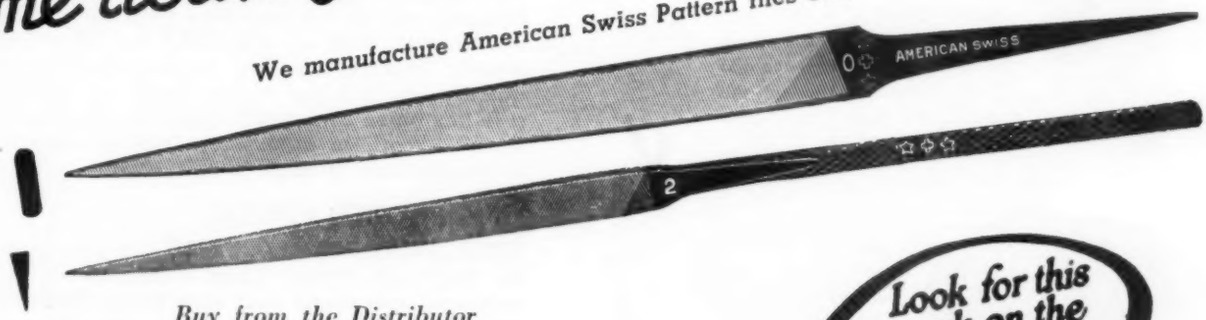
for MODERN PRODUCTION

American Swiss Pattern Files—the only kind we make—produce more work at lower cost because they are faster cutting, last longer and reduce time on filing jobs.

Our entire efforts are concentrated on the development and manufacture of only Swiss Pattern Files. Our organization is the only company which specializes on this type of file. We have devoted more than forty years exclusively to the manufacture of American Swiss Pattern Files of Precision. The reputation thus earned is the result of a background of long experience in producing precision files for most every class of service.

American Swiss Files of Precision

We manufacture American Swiss Pattern files only



Buy from the Distributor

SHAPES AND CUTS AVAILABLE

There are more than 2500 cuts, shapes and sizes from which to select your requirements. Cuts: 00—0—1—2—3—4—6; lengths from 3" to 12."

SHAPES INCLUDE:

Hand	Checkering	Barrette
Narrow Pillar	Flat	Pippin
Half Round	Die Sinkers	Round
Half Round Ring	Needle	Three Square
Knife	Rifflers	Slitting
Equalling	Pillar	Parallel Round
Cant	Extra Narrow Pillar	Mill
Crochet	Slim Half Round	Broach
Square	Crossing	Round Edge Joint
Metal Saw	Warding	Square Edge Joint

Send for complete catalog TODAY. Ask us to show you how and why you'll save money with modern *AMERICAN SWISS PATTERN FILES.* We'll gladly supply name of our nearest distributor.

Look for this mark on the tang of a File

TRADE FILES ONLY THE BEST ARE GOOD ENOUGH TOOLS MARK

American Swiss File & Tool Co., Elizabeth, N. J.

ALSO MANUFACTURERS OF MECHANICS HAND TOOLS AND KNURLS

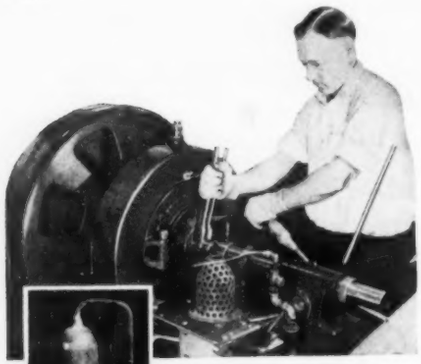
ETNA SWAGING MACHINES

The *Modern Way* of tapering, sizing or reducing round solids or tubing

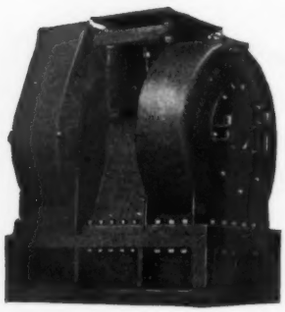
This is the #406 ETNA used in pointing tubes. The No. 400 series of ETNA Machines are built for big work — have a maximum capacity of 4" on tubing and will take dies from 6" to 18" long.

ETNA HAS THE ANSWER

The Country's Leading and Most Efficient Plants Are Using ETNA SWAGING MACHINES



This is the #103 ETNA used in swaging a 1⅛" x .050" wall copper tubing with ends closed in hemispherical shape to 3/16" diameter hole — at the rate of 900 pieces per 8-hour shift.



Hot or cold work can be handled on ETNA Machines without additions or changes and the larger sizes have ample storage capacity in the sturdy base for circulating fluids.

FOR FASTER PRODUCTION

A Detroit carburetor plant recently stepped up production 55% on a sizing operation with a #32 ETNA. A leading refrigerator manufacturer is setting new record standards in swaging copper tube with a #103 ETNA.

FOR REDUCING COSTS

Hundreds of plants, where sizing, tapering or reducing round solids or tubing is on a production basis, have saved thousands and thousands of dollars by calling on ETNA's specialized experience in this type of work.

FOR BETTER WORK

For example, one of the largest tube makers used to point tubes for draw bench by hammering—with the result that ends of tube were smashed, scale trapped and die life impaired because of tube scoring in drawing. With a #406 ETNA they *now* point tubes evenly, leaving a hollow point so pickling fluid can quickly get into the entire length of tube providing a better finish and better work on the draw benches. Result—Work is done more rapidy—rejections are at an absolute minimum.

FOR IMPROVED FINISH

ETNA SWAGING MACHINES are precision built to do precision work. They eliminate old fashioned swaging operations and give better finished work—reducing machinery, even sometimes eliminating it.

Write for free booklet

• SIZES AND CONSTRUCTION — ETNA SWAGING MACHINES are built in capacities of ⅜" to 4" diameters with die lengths of 1" to 18". Larger sizes built to order. ETNA Machines are safety proof—employing the finest selected alloy steels, careful heat treating and forgings in all parts involving wear or strain.

Take advantage of the experiences of the country's leading plants.—See how they solved manufacturing problems with ETNA MACHINES. Booklet contains many case studies.

THE ETNA MACHINE CO.

3400 Maplewood Avenue • Toledo, Ohio

Meet Your Competition "ARMED"!

FOR LONG RANGE HARD-HITTING ECONOMY—

INSTALL THE

O K SYSTEM

MANY plants which, in point of management, are right up to the minute, still have in their shops far too much equipment of twenty years ago. In the meantime, metal cutting practice has "moved up," making it harder for them and easier for their competitors who have been quicker to note the passing of time!

If a check-up of your metal cutting equipment reveals a preponderance of the solid type, by all means investigate the savings of the O K Inserted-Blade Metal Cutting Tool System, several of which are illustrated here. These tools promote economy and speed because only the blades, or bits, are made of the more expensive cutting steel and because of the wide variety of designs which can be kept on hand ground for immediate use.

There is an O K Tool for every modern metal cutting job, and you can completely outfit your entire plant, or you can equip a department or even a single machine at a time and still reap proportionate benefits. A good beginning is to

Send for the O K Catalog

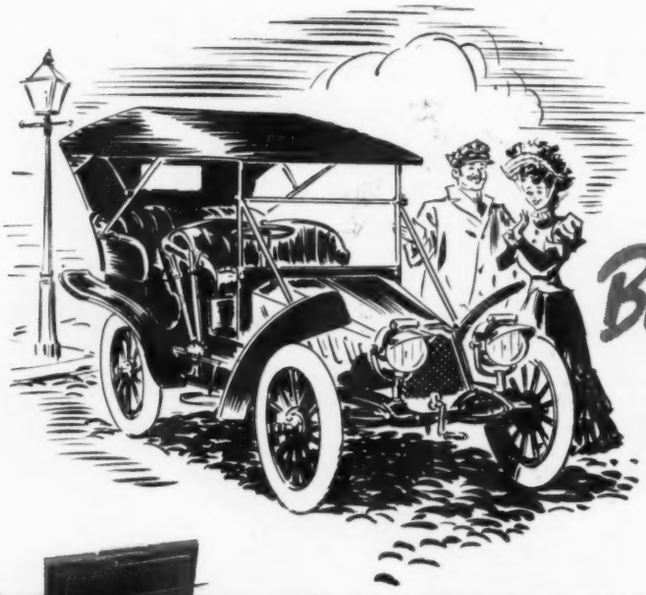
It illustrates and describes the O K line of milling cutters, end mills, face mills, boring heads, reamers, counter bores, multiple operation set-ups; also single-point tools for lathes, shapers, planers, etc. If you have a problem in metal cutting that causes trouble, tell us about it. Our representatives will be glad to make recommendations.

THE O K TOOL COMPANY, SHELTON, CONN., U.S.A.

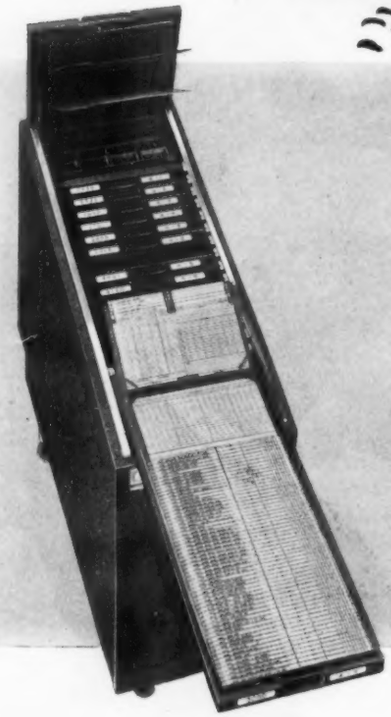
TRADE O K MARK

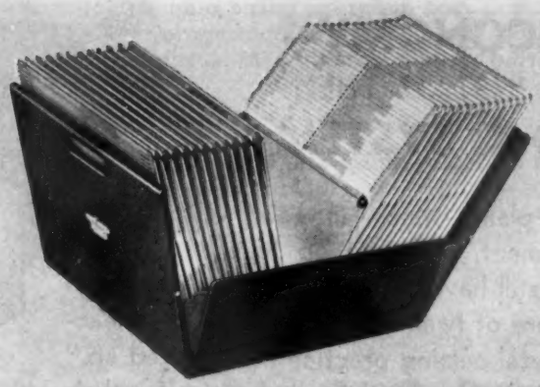
INSERTED-BLADE METAL CUTTING

TOOL SYSTEM



Business Systems Become Obsolete Too!





Left: THE NEW FLOOR MODEL KARDEX brings to executives and clerical workers a new high in posting convenience and fact-visibility plus portability.

Above: THE NEW KOLECT-A-MATIC LEDGER has all the multi-benefits of a Kardex visible record . . . signals flash what items or accounts need attention . . . they tell what action should be taken . . . and they tell when.

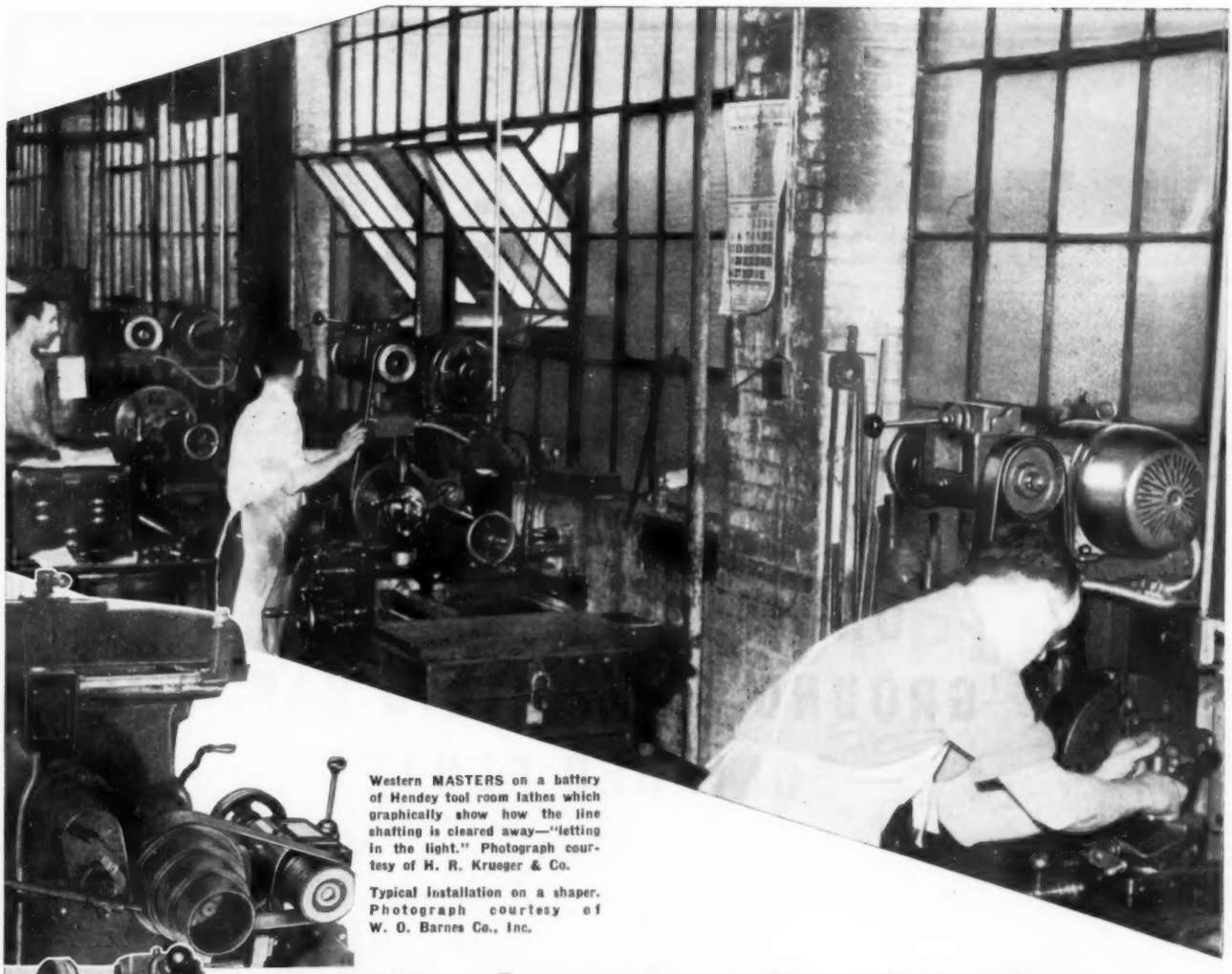
BOON companions of obsolete machines or systems are inefficiency, waste, excessive labor costs, and unsatisfactory results. But, while you can see the waste of machines, far too frequently the waste of old-fashioned methods and systems is buried.

Modern Remington Rand systems and equipment bring the hidden costs of running your office and shop to the surface—then, and only then, can you take the necessary steps to rid your business of the profit-reducing drain of "lazy dollars". See your nearest Remington Rand office for a free survey of your systems and equipment. Without obligation, you can get the full facts on modernizing all your methods at a profit!

Inventory control, cost control, fixed asset records, production control, wage & hour control, tool crib control—These, and many other of your records, can be modernized at a profit to you!

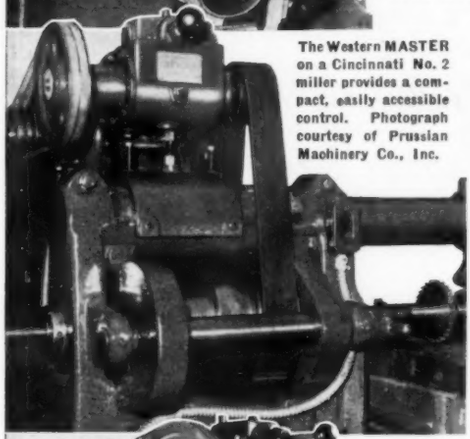
KARDEX *visible systems of* BUSINESS CONTROL

Remington Rand Inc. Buffalo, New York

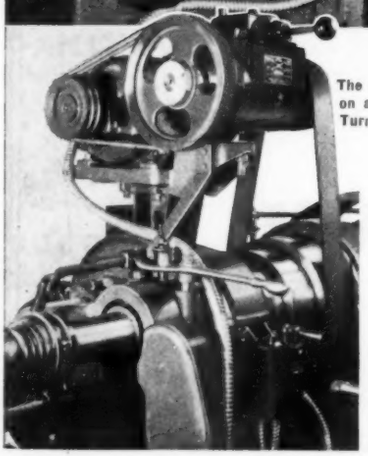


Western MASTERS on a battery of Hendey tool room lathes which graphically show how the line shafting is cleared away—"letting in the light." Photograph courtesy of H. R. Krueger & Co.

Typical installation on a shaper. Photograph courtesy of W. O. Barnes Co., Inc.



The Western MASTER on a Cincinnati No. 2 miller provides a compact, easily accessible control. Photograph courtesy of Prussian Machinery Co., Inc.



The Western MAJOR on a Warner-Swasey Turret lathe.

Let in the Light . . .
with WESTERN TRANSMISSIONS

You can go right on with your modernization program, according to schedule, clearing out the line shafting—"letting in the light"—even though you can't get the new machines you wanted. The Western MASTER and MAJOR for 1-5 and 5-10 horsepower motors respectively, together with a SUPER built to specification where more than 10 H.P. is needed, provide a complete line of transmissions for lathes*, milling machines*, shapers*, turret lathes*, automatics, radial drills, slotters, bolt cutters, gear cutters, die sinkers, boring mills and other machine tools where a motor driven, self contained, selective speed transmission unit is desired.

The WESTERN TRANSMISSION makes FOUR SPEED changes (forward and reverse), instantly available, gear ratios 1:1, 2:1, 3:1, 4:1.

* Illustrated at left, the MASTER (1-5 H.P.) $95.00; the MAJOR (5-10 H.P.) $145.00.

Send for complete information regarding any machine tools you wish to modernize.

WESTERN MANUFACTURING COMPANY

3400 SCOTTEN AVENUE — DETROIT, MICHIGAN

GEARS and TRANSMISSIONS since 1914

TRY Victor's HIGH SPEED TWIST DRILLS

ONE OF THE FINEST GROUND FROM SOLID BAR —POLISHED FLUTES

Sizes ranging from 1/16 to 1/2 in. by sixty-fourths, also Nos. 1 to 60 and Letter Sizes A to Z. Also drills 12 in. long. 7/32 to 1/2-in., with 9-in. cutting flutes.

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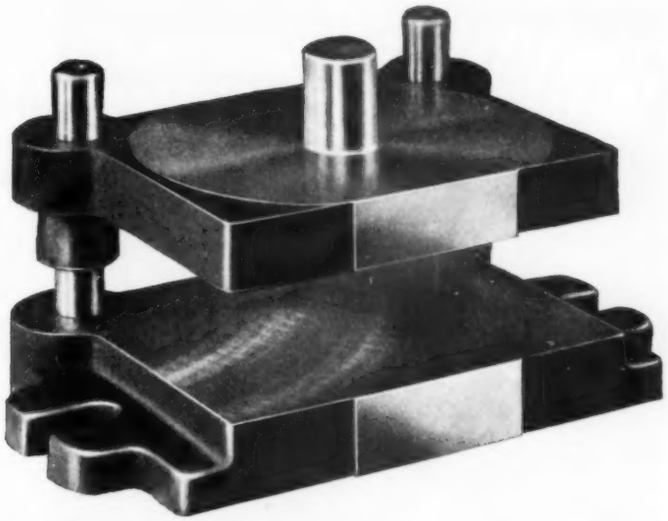
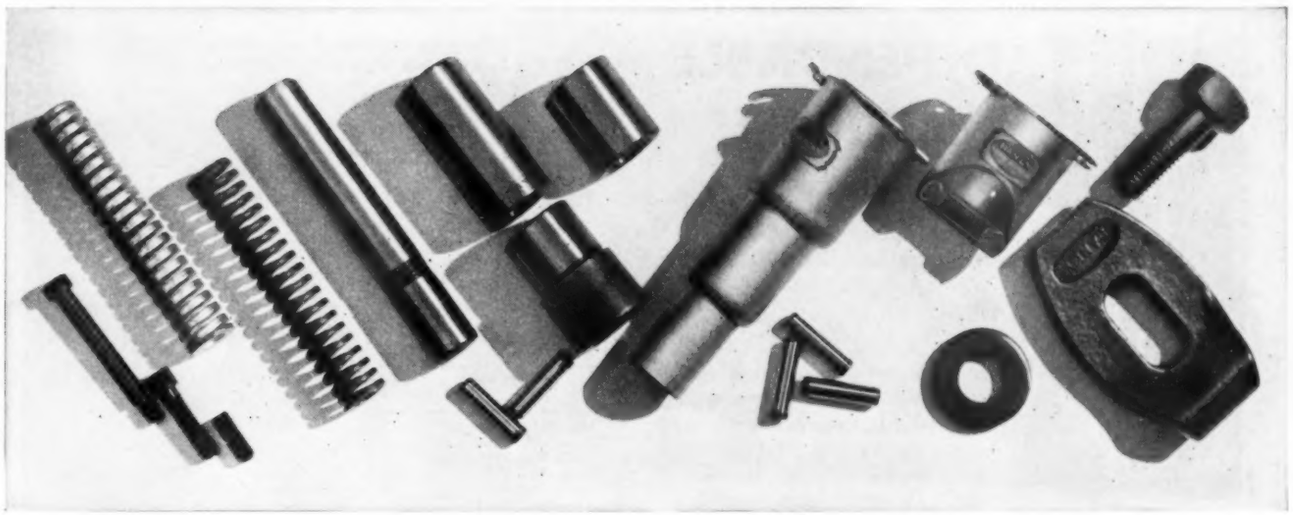


PRECISION DIE SETS and DIE MAKERS' SUPPLIES



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DIE SETS and DIE MAKERS' SUPPLIES

WRIGHT *Improved* HIGH SPEED HOISTS

..DEPENDABLE *is RIGHT!*

There are 21 definite points of superiority that make the Wright the dependable hoist it is. Users soon discover these points and value them.

Every Wright Improved High Speed Hoist is fast, smooth and positive in action—because of Wright precision load wheel bearings. It is immune to corrosion—because of its full zinc coating. Its load chain always stays in the pocket, regardless of operating position—because of the Wright safety guard. These are only three of the 21 points. The others are equally important.

Wright Trolleys are as dependable as Wright Hoists—made to give long, faultless service.

Write for the Wright Catalog describing modern hoisting equipment in capacities from ¼ to 50 tons.

BUY ACCO QUALITY *in Wright Hoists, Cranes and Trolleys; Tru-Lay Preformed Wire Rope; Reading-Pratt & Cady Valves; Campbell Abrasive Cutting Machines; American Chains; Page Welding Electrodes and Page Wire Fence.*

WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA

In Business for Your Safety

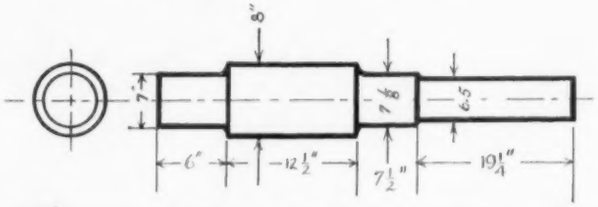
AMERICAN CHAIN & CABLE COMPANY, Inc.

Would Saving $2.25
EVERY HOUR YOU OPERATE A LATHE
Interest You?

If you machine steel castings, forgings or bar stock, the above figure is a conservative estimate of the savings made possible by using

KENNAMETAL
STEEL-CUTTING CARBIDE TOOLS

$41.90 for tools brought a 438% PROFIT
Turning This SAE 1050 Forging:



TOOL	FORMER METHOD 18-4-1 High Speed Steel	PRESENT METHOD KENNAMETAL
Roughing Speed	45 ft./min	180 ft./min.
Roughing Feed	¼" per rev	.040" per rev.
Semi-Fin. Speed	50 ft./min	No Semi-Finishing cut Required
Semi-Fin. Feed	⅛" per rev	
Finishing Speed	40 ft./min	275 ft./min.
Finishing Feed	¼" feed	.030" feed
Floor to Floor Time	3 hr. 15 min	1 hr. 5 min.
Labor Cost	$2.92	$1.08
Overhead	$6.23	$2.27
Total Cost	$9.15	$3.35

Savings per piece = $9.15 −$3.35 = $5.80
Savings per 8 hr. day = $37.59
Saving per Week = $37.59 x 6 = $225.54
Cost of 2 KENNAMETAL tools (lasting one Week) $41.90
Profit = $225.54 −$41.90 = $183.64 or 438%

You, too, can realize equal or greater savings on your turning, boring, milling or shaping jobs by specifying KENNAMETAL-tipped tools for your shop. KENNAMETAL machines steel of all hardnesses up to 550 Brinell at speeds comparable to those used in machining much softer steel with speed steel tools. Non-cratering and highly resistant to breakage.

The KENNAMETAL representative is a trained specialist in metal-cutting tools. Why not let him show you how KENNAMETAL can modernize your machine shop practice . . . lower costs . . . increase profits . . . and turn out a better product. Send for him today—no obligation.

McKENNA METALS Co.
103 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

Representatives in the Principal U. S. Industrial Areas, in Birmingham, England, and in Glasgow, Scotland.

Everything Points to Greater Comfort and Safety ...in this New

SUPER DURALITE-50 GOGGLE

6 CURVE SUPER ARMORPLATE LENSES
LIGHTWEIGHT EYECUPS ...BETTER VENTILATION
NON-RUBBER HEADBAND ... PERMANENTLY ADJUSTABLE

This completely new goggle marks new high levels in comfort, protection, appearance and value.

Super Duralite-50 is a lightweight goggle built to take punishment. The close-fitting eyecups permit wide angle of vision . . . the deep-curved Super Armorplate Lenses have *greater impact-strength* than flat safety lenses. Eyecups are not affected by water, oil, perspiration or sterilizing solutions. And the metal side-screens increase effective ventilation. New non-rubber headband is quickly, *permanently* adjustable to any headsize. Insulated nose-bridge is also adjustable.

Call in your American Optical Industrial Representative . . . and have him show you today's leading value in eyecup safety goggles. Or send for detailed fact-sheet on the new American Super Duralite-50.

BUY AMERICAN...

By American Optical Company

Factories at Southbridge, Massachusetts

MANUFACTURERS, FOR MORE THAN 100 YEARS, OF PRODUCTS TO AID AND PROTECT VISION

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Offering you

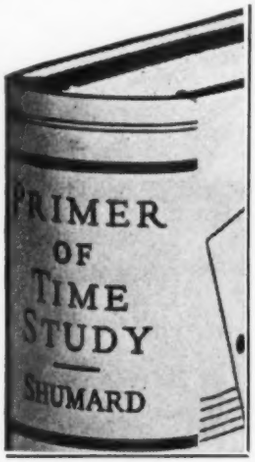
a complete time-study course in one 520-page book

No need to tell you the opportunities today for competent time-study men. If you have any contact with industrial plants, you know how great is the demand for men equipped to handle time-study analysis. Specialists in the field are making enviable records.

Now we announce a thorough, practical home-study course in time study, written by an industrial engineer who has trained many specialists.

Just Published

A Primer of Time Study



By F. W. SHUMARD

520 pages, illustrated, $5.00

This book assumes no previous knowledge of the subject on the part of the reader. It begins with the time the stop watch is first wound and step by step carries you through the whole procedure until overhead rates are set up and cost control is established.

Every detail is clearly, competently explained. Abundant forms, charts, tables, problems, illustrative examples, clarify the principles—show you just what to do and how to do it. Each chapter is followed by questions and problems for which definite answers are given. The introduction includes instructions for studying the book and for rating one's self on the test answers.

Can you install a complete time-study system in another plant?

Do you know how to make use of the leisure time of operators who have available time between machine cycles?

Can you prescribe time standards or piece work prices for jobs run in combination, without periodically changing rates to satisfy new combination?

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JOHNSON No. 70 Hi-Speed Heat-Treating Furnace

2500° Fire-Box Temperature

Carborundum Hearth Standard Equipment

This low cost, economical furnace will speed up work in your tool shop. The Johnson No. 70 furnace quickly attains a temperature of 2500°. Especially designed for hi-speed steels and die work. Equipped with Johnson Blower and Carborundum Hearth. Combustion Chamber heavily lined with insulating refractory. Available in two sizes in either bench or pedestal style. No. 70 Only..... **$79.50** F.O.B. Cedar Rapids Iowa

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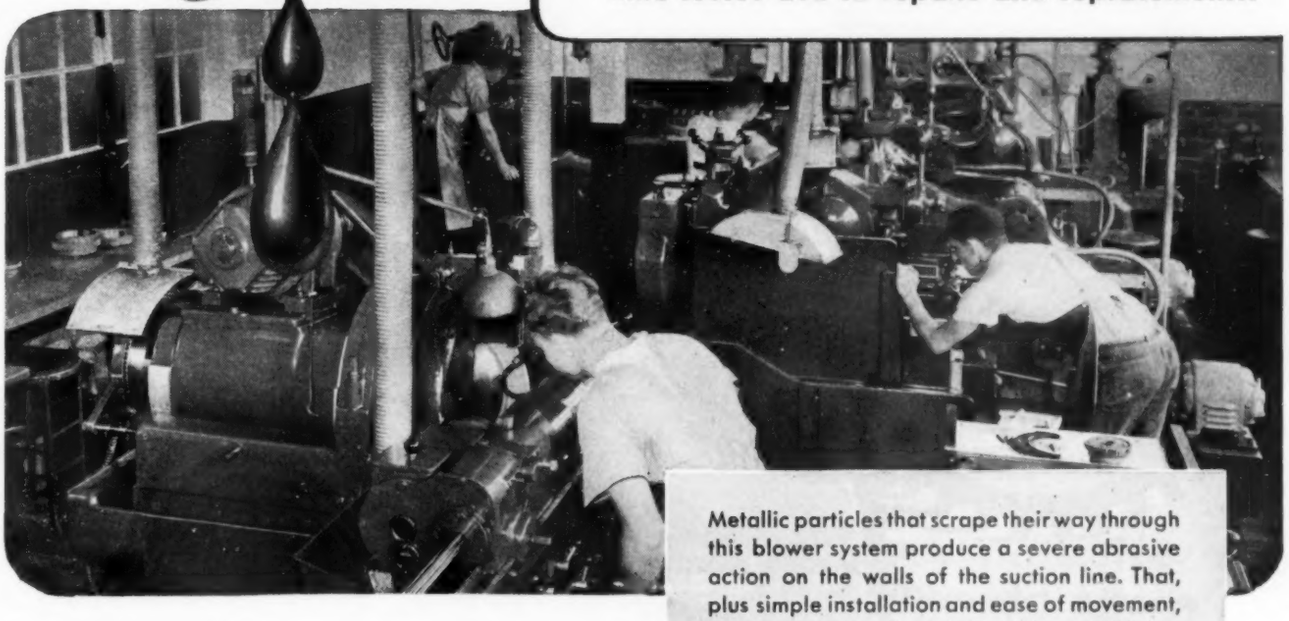

Metallic particles that scrape their way through this blower system produce a severe abrasive action on the walls of the suction line. That, plus simple installation and ease of movement, are the reasons why it is flexible metal hose.

DESIGNERS of modern machine tools and operators of up-to-date machine shops have learned that it pays to use the RIGHT flexible connections on all of their equipment—whether for the blower system, coolant lines or hydraulic feed. Poor connections mean eventual breakdowns and breakdowns cost money.

To avoid these costly shutdowns, leading manufacturers of machine tools are equipping their units with strong, durable American Flexible Metal Hose and Tubing—as flexible as garden hose, with all the strength you'd expect from its all-metal construction. Would you like to know more about this money-saving flexible metal tubing? Just drop us a note saying: "Send me your literature for the machine tool industry."

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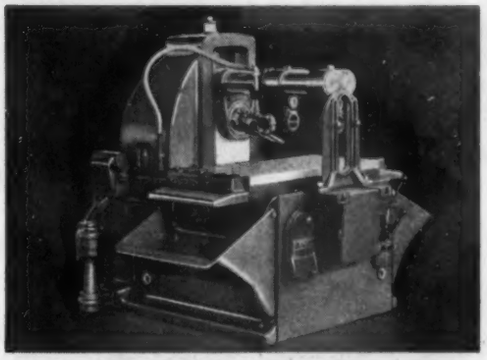

Here, American Seamless is used for conveying coolant under pressure. On modern machine tools, this super-tubing saves time and money on installation and assures a free flow of liquid to coolant nozzles at all times.

American Metal Hose

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AMERICAN METAL HOSE BRANCH of THE AMERICAN BRASS COMPANY

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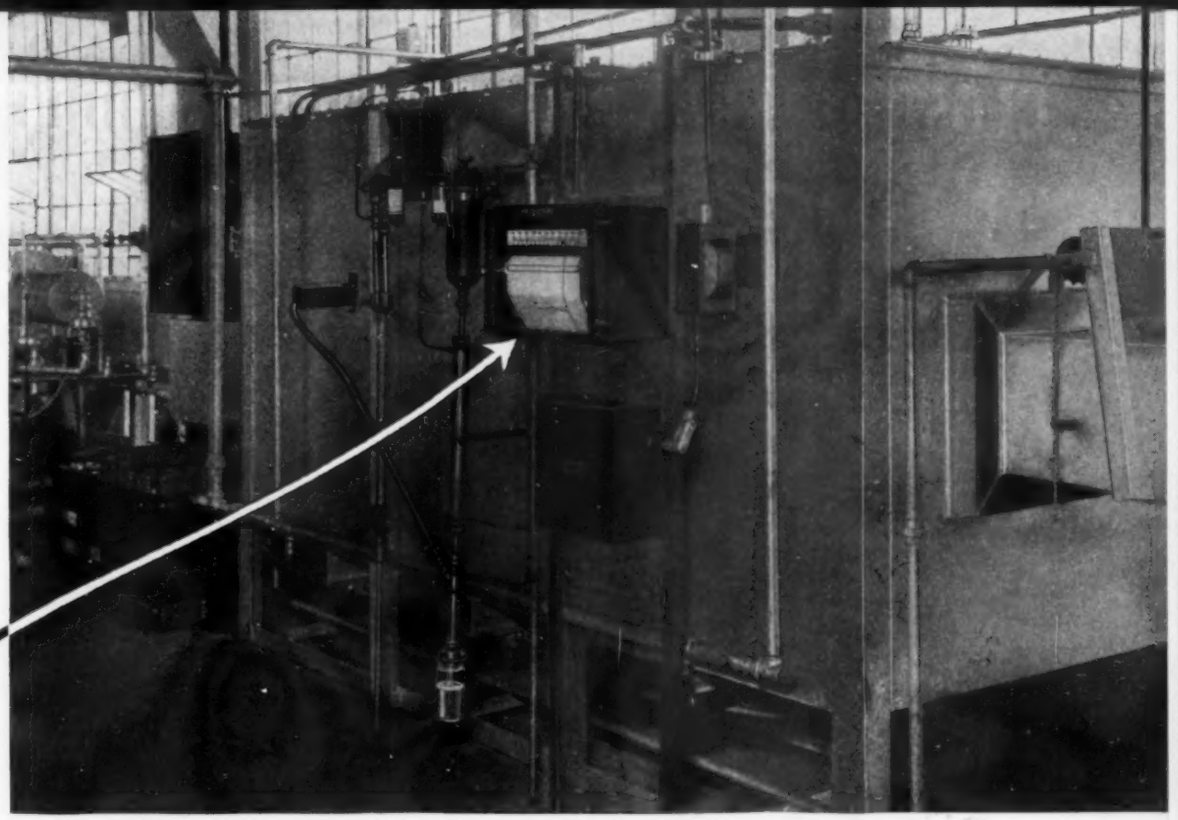

BROWN ANALY-GRAPH Recorder and Sampling Unit installed on Hydrogen Brazing Furnace.

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the Correctness of the Furnace Atmosphere—

Eliminating Scaling, Decarburization, and Other Harmful Attacks

Furnace atmosphere can now be measured precisely by the improved ANALY-GRAPH, which operates directly from AC eliminating the need for current adjustment.

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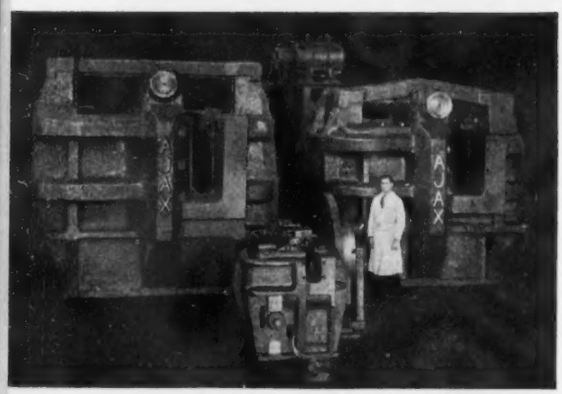

The dimensions of the 1 inch Ajax Forging Machine in foreground contrasts strikingly with gigantic bulk of 8 inch machine.

This AJAX 8 inch Forging Machine is designed to accommodate dies 46 inches in height, permitting as many as four progressive operations on large stock in fabricating heavy duty forgings.

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WRITE FOR BULLETIN No. 65-A

THE AJAX MANUFACTURING COMPANY

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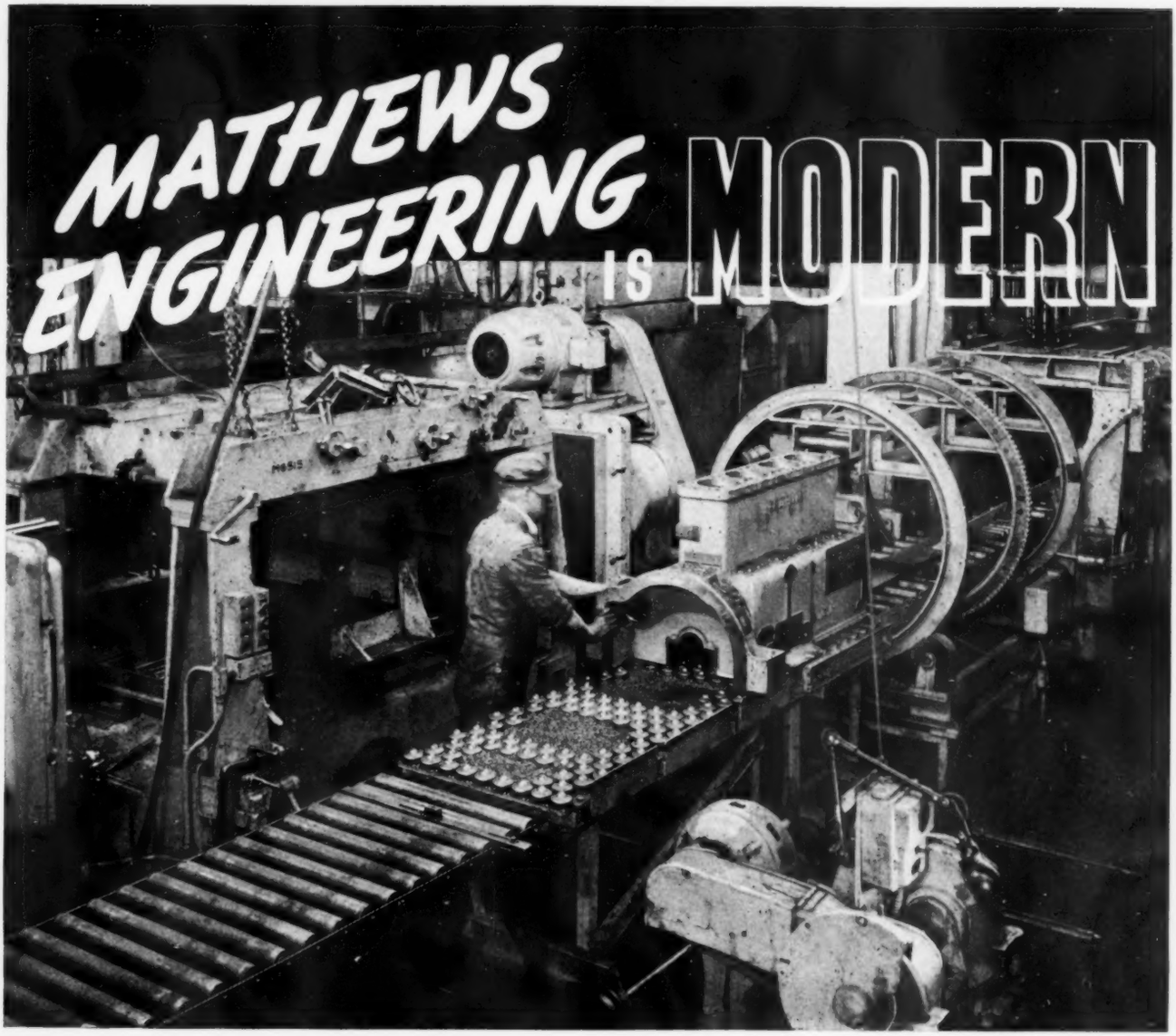

● Plant modernization quite frequently presents difficult material handling problems. The minimizing of worker fatigue, and the elimination of "bottle necks" and confusion are recognized more than ever before as important factors in this connection. The speed and economy of operations which are necessary in modern manufacturing demand the proper type of conveying equipment and the best possible application of it.

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POSITIONS VACANT

(See also "Salesman Wanted")

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MACHINE DESIGNER, preferably with experience in designing and detailing drilling machinery. State age, experience, education and salary expected. P-810, American Machinist, 330 W. 42nd St., New York, N. Y.

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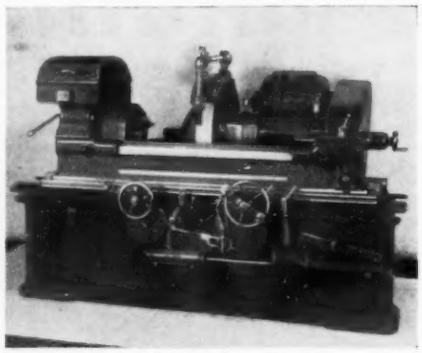

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10"x72"	14"x96"	23"x120"

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- No. 3 Standard Milwaukee Vertical Rotary
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- 44"x36"x12' Gray
- 48"x48"x16' Niles-Bement-Pond
- 60"x48"x20' Hamilton
- 72"x50"x16' American

Presses
- No. 0I, No. I V. & O., O.B.I., M.D.
- No. 1½ V. & O., O.B.I., Geared M.D.
- No. 20 Bliss, O.B.I., Motor Drive
- No. 3, No. 5 V. & O., O.B.I., Geared M.D.

Turret Lathes
- No. 5 Foster Universal, Timken Bearing
- No. 1-A Warner & Swasey, Motor Drive
- No. 2-A Warner & Swasey, A.C. & R.F.
- No. 2-B Foster Univ., Timken Bearing
- No. 3-A Warner & Swasey Universal, 4¾" H.S.
- 18" Libby-International, 5" H.S.
- 34" Gisholt, Motor Drive
- No. 4-L Gisholt, 9¼" H.S., cross sliding turret

HILL-CLARKE MACHINERY COMPANY
651 Washington Blvd. Chicago

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CLEVELAND, 2½" BAR HORIZ. MILL
LANDIS #35-3½" BAR HOR. BOR MILL
BEAMAN & SMITH 4" HOR. BOR MILL
BULLARD 24", N.E. VERT. BOR. MILL
N.B.P. 42", 44" VERT. MILLS; 2 HDS.
N.B.P. 38-44" VERT. BOR. MILL
N.B.P. 54" VERT. BOR. MILL, 2 HDS.
GISHOLT 42" VER. BOR. MILL, P.R.T.
COLBURN 72" VERT. 2 SWIVEL HDS.
NILES 90" VER. BORING MILL
N.B.P. 72"x72"x16' 2 HD. PLANER
N.B.P. 60"x60"x18' 2 HD. PLANER
W. & P. 84"x48"x18' 4 HD. PLANER
W. & P. 60"x42"x19' 4 HD PLANER
CINCINNATI 36"x30"x5' SINGLE-HD. PLANER; KELLER ATTACHMENT
CIN. 36"x36"x8' PLANER; 2 HDS. P.R.T.
HEALD #20, #22, #255 ROTARY SURF.
HEALD #25 ROT. HYD. SURF. GRIND.
ABRASIVE #3, #5 SURFACE GRINDERS
BLANCHARD #16A DIAL FEED GRIND.
BLANCHARD NO. 16-30" CHUCK; M.D.
B. & S. 13 UNIV. GRINDERS; M.D.
PFAUTER #2 HOB GRINDER
GLEASON 3", 6", 11", 18" GEAR GEN.
G & E 16" SPLINE HOBBER
G. & E. 12H & 18H GEAR HOBBERS
B. & S. #3H GEAR CUTTER
FELLOWS NO. 7 & 71 GEAR SHAPERS
FELLOWS NO. 61 & 615 GEAR SHAPERS
GLEASON 24" BEVEL GEAR PLANER
INGERSOLL 24x24x12', 36x36x12' ADJ. RAIL. MILLERS
B & S NO 4B PL. MILLER
KEMPSMITH #1, 3 UNIV. MILLERS
B. & S. 3A UNIV. MILLER; MO. IN BASE
TAYLOR FENN 6" SPLINE MILLER
P. & W. 4½"x12" THREAD MILLER
P. & W. 12x60" THREAD MILLER
VAN NORMAN ½ DUP. MILLER
FOSTER #1B TURRET LATHE
AMER. 24"x12', 16"x8' GRD. LATHES
HOUSTON, STANWOOD & GAMBLE 52"x24' LATHE
PUTNAM 36"x28' GRD. HD. LATHE
RYERSON 60"x24' LATHE
LO SWING 8x60", LATEST TYPE LATHE
SELLERS 42" WHEEL LATHE
L. & S. #3 DUOMATIC LATHE; 6' BED
L. & S. #3 DUOMATIC LATHE; 10' BED
FAY 14" AUTOMATIC LATHE
GISHOLT DYNAMIC BALANCER
AMER. 6' UNIV. RADIAL DRILL
WESTERN 6' RADIAL DRILL
NAZEL #8 HAMMER
AJAX 3" UPSETTER
DILL 18" SLOTTER
OHIO 36" DREADNAUGHT SHAPER
G. & E. 32" INVINCIBLE SHAPER; M.D.
COLUMBIA 24" SHAPER, M.D.
POTTER & JOHNSTON 24" SHAPER

PARTIAL LIST

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Landis Plain Grinders 12"x42", 12"x52", self contained countershaft, motor drive

Landis Crankshaft Grinders 16"x48", self contained countershaft, motor drive

No. 6 W&S Plain Turret Lathe

4½', 11" Column Morris Radial Drill, Gear Box

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Allis-Chalmers Rotary Compressor, 238 cu. ft. Direct M.D. as good as new

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AUTOMATICS:

"Brown & Sharpe Automatics" #00G, #0G, #00, #0, #2's—All sizes. Full Automatics or Turret Formers.

3¾" Model "B" National Acme 4-spindle
3" Model "B" National Acme 4-spindle

6—1¾" & 2¼" Model "F" Gridleys, 4-spindle

1—6-Spindle 1⅝"x7" New Britain #227 Automatic

2—6" x 6¾" Goss & DeLeeuw 4-spindle Chuckers

1—#6 Warner & Swasey Universal Geared Head Lathe.
1—#4 Warner & Swasey Motor Driven Lathe.

MISCELLANEOUS:

1—30"x30"x18' Gray Planer, 2 heads
1—No. 13-C Natco Hydr. Mult. Drill
6—No. 12 Brown & Sharpe Plain Grinders
1—12"x36" Landis Plain Cylindrical Grinder
3—No. 3 Cinc. Pl. Millers, Slotted S.N.
1—No. 6 Gardner M.D. Disc Grinder, 26" Discs
1—#24 Gardner Horizontal Disc Grinder, 53" disc
1—No. 2 Knight Vertical Milling & Drilling Machine
1—No. 1B Cleveland S.E. Punch—36" Throat
1—1½" Acme Upsetting & Heading Machine—steel bed M.D.
1—11'x16 Ga. Stoll Square Shear
6—6-A Potter & Johnston Lathes
7—Crankshaft Lathes (Wickes & Lodge & Shipleys)
50—Drills of all sizes

These are but a few of the many items we have in stock.

RIVERSIDE MACHINERY DEPOT
249 St. Aubin Ave. Detroit, Mich.

MILLING MACHINES

#2 LeBlond Cone Drive Universal
#3 B&S Cone Drive, plain, taper nose
#1Y B&S Rack Feed
18" Cincinnati Sgle. Hd. Automatic
#12 B&S Manufacturing Type
#13B B&S Manufacturing Type
#37 B&S Duplex Automatic
#1 Knight Drill. & Mill. Machine
48" Newton Dble. Spdle. Continuous

THIS IS A PARTIAL LIST

The Strong, Carlisle & Hammond Co.
1392 West Third St. Cleveland, Ohio
2832 E. Grand Blvd. Detroit, Michigan

UNUSUAL VALUES

Gray Planer: 36"x36"x14'—2 heads
Shapers: 24" G&E; 24" Barker; 2, 16"
Lathes: 18"x8' Monarch; 14"x6' Monarch; 24"x12' South Bend
Milling Machines: #4-#3 LeBlond Plain; #1-½; #25
Drill Presses: 28", 24" Hoefer, 25", 20"; several high speed
Hack Saw: 6x6 Peerless, h.s.; 6x6 L.W. h.s.
Radial Drills: 5' Bausch
Turret Lathes: ⅝" Acme; N. 3 Foster; #4 Woods; 21" and 24" Gisholt
Miller: 20"x24"x8' Ingersoll
Presses: No. 24 Toledo Open Back Cam Drawing No. 0 and #1, #2, #3 Federal O.B.I. 60" Robinson Toggle
300 Other Machinery Items
MOTORS—New 5 HP 3 phase, ball brg. $55.75

Other sizes equally low priced. Also rebuilt motors.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

42" King Boring Mill, M.D.
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4' Carlton Radial Drill, M.D.
24" Bullard Rapid Production Mill
50-Ton Henry&Wright Dieing Press, M.D.

D. E. DONY MACHINERY CO.
47 LAURELTON ROAD
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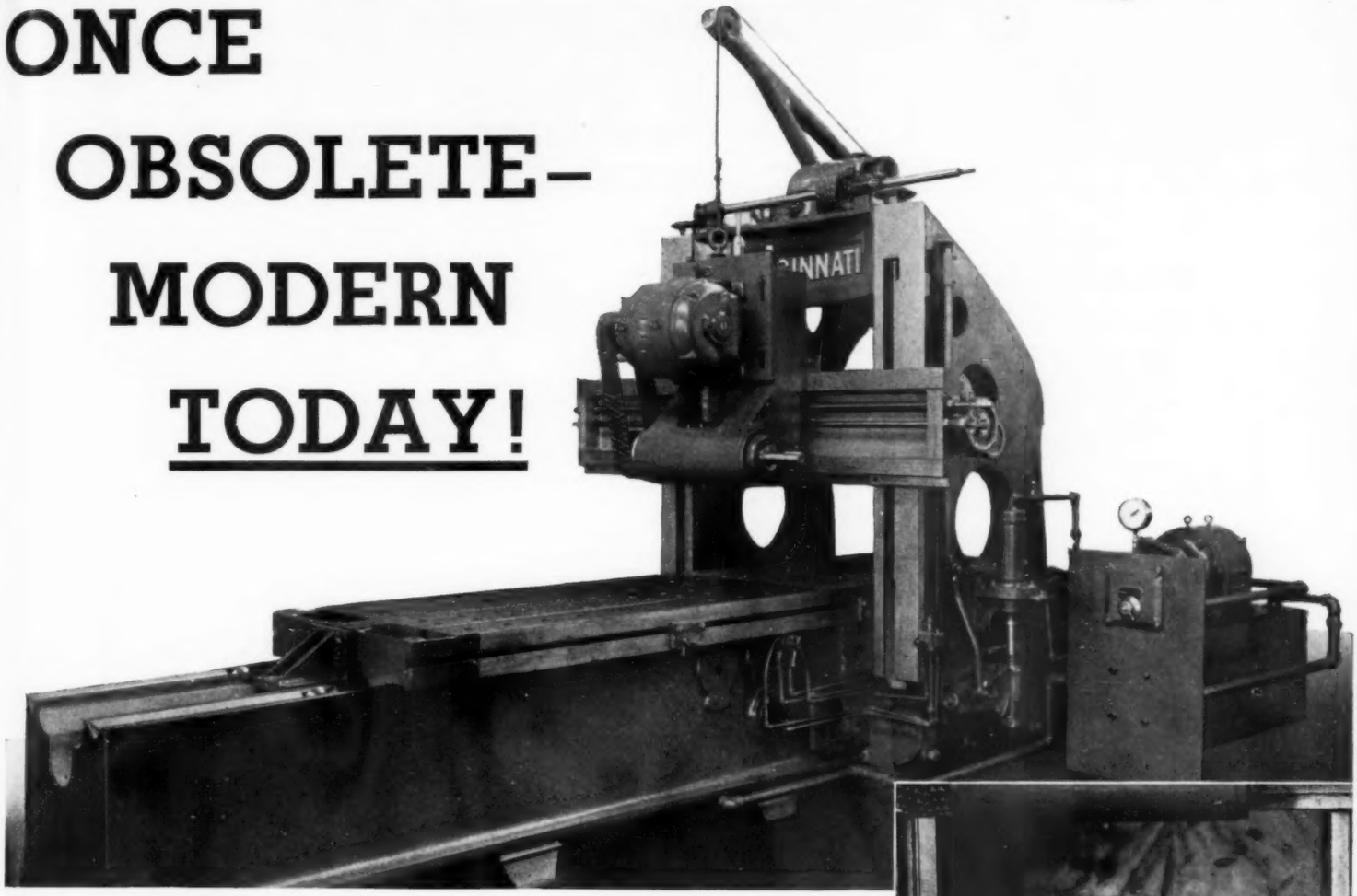

● This machine tool was a belt-driven planer when it came to our plant. As with so many machines today, it was in good condition . . . but outmoded. It was specially designed and rebuilt by Simmons* into a hydraulic grinder at a substantial saving over the cost of a new tool, yet with *no sacrifice whatsoever* to accuracy or durability. Today it is performing to the complete satisfaction of a leading manufacturer of manganese steel castings.

Here, then, is an excellent illustration of what intelligent engineering and rebuilding can perform for industry in its modernization program. It is typical of the work which for thirty years has made SIMMONS ENGINEERED REBUILDING the hallmark of perfection in reconditioned machinery.

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* The rail is new, as is the grinding wheel head (wheel and guard not shown). A 6-inch diameter honed cylinder with a 9-foot stroke, operating at a maximum pressure of 300 pounds per square inch, gives continuously variable table speeds of from 0 to 40 feet per minute with practically instantaneous reversals. A 2-to-1 differential piston gives a maximum table thrust of 4000 pounds, both forward and reverse.

Three motors are used: a 15 HP, 1800 RPM motor for the wheel head; a 10 HP, 1200 RPM motor for the constant displacement pump to operate the hydraulic traverse of the table and the wheel feed; and a 3 HP geared head motor to raise and lower the rail.

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Export Office
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ALBANY, NEW YORK

Cable Address
Simmons, Albany

VERTICAL BORING MILLS

44" Niles-Bement-Pond Heavy Duty; 2 swivel heads; Power Rapid Traverse; M. D.
48" Colburn; 2 swivel heads; S. P. D.
24" Bullard Rapid Production; 1 side head; 1 turret head; Power Rapid Traverse; M. D.

MILLING MACHINES

#15 Garvin Vertical; M. D.
#33 Brown & Sharpe Automatic; Motor in Base
#3 Cincinnati; Belt Drive
24" Cincinnati Duplex; M. D.
#6 Whitney Hand; vertical attachment
#3 Davis Thompson Rotary Mill; M. D.

LATHES

30" x 17' Houston Stamwood & Gamble; B. D.
26"-48" x 28' McCabe Double Spindle; M. D.
20" x 8' Hendey Geared Head; M. D.
18" x 8' Lodge & Shipley Geared Head; M. D. Taper Attachment.
18" x 8' National; B. D.

GRINDERS

#16 Blanchard Direct Motor Drive Vertical Surface; 26" magnetic chuck.
#33 Abrasive Surface; Motor in Base
#3 Abrasive Surface; Motor in Base
#24 Gardner Horiz. Disc; 53" dia.
#14 Gardner Disc; 20" dia.
#8 Badger Disc; 26" dia.
#1 Fraser Univ. Tool & Cutter
#12 Diamond Disc

PLANERS

36" x 36" x 20' Chandler; 4 heads; M. D.
24" x 24" 6' Gray; M. D.
18' Hilles & Jones Plate; ¾" cap.

AUTOMATIC SCREW MACHINES

1¾" Gridley Model G 4-spindle; M. D. Threading Spindle
1" 5-spindle Acme; M. D.—Threading Spindle
1¼" Cone 4-spindle; M. D.
1¼"—1½" Cleveland, Model A; M. D.

DRILL PRESSES

#2 Avey 4-spindle; M. D.
4-spindle Edlund; M. D.
2-spindle Leland Gifford; M. D.
Leland Gifford Single Spindle; M. D.
Avey Single Spindle; M. D.

SHEARS

#3 Long & Allstatter; 24" throat; 101" blade; ¼" cap.; M. D.
Hilles & Jones Throatless; 12" blades; cap. ⅜" plate; ½" x 4" flats.

MISCELLANEOUS

HAMMER, 300-lb. Bradley Helve
GEAR SHAPER, #62 Fellows; M. D.
TURRET LATHES, 3" x 36" Jones & Lamson; S.P.D.
HYDRAULIC RIVETER, 150 ton Chambersburg; 6" stroke
SHAPERS, 24" Gould & Eberhardt; M. D.
ROLLS, Wickes; vertical type; cap. 12' x1½"; largest roll 23" dia.; 2 smaller rolls 17" dia.

SUN MACHINERY COMPANY, INC.
36 Van Vechten St., Newark, N. J.

DEPEND ON DELTA FOR DEPENDABLE EQUIPMENT

LATHES
14" x 6' Monarch.
16" x 8' Lodge & Shipley.
16" x 10' Sebastian Geared Head.
18" x 8' Monarch Geared Head.
18" x 10' Monarch.
24" x 12' Boye & Emmes.
26-48" x 14' McCabe.

SHAPERS
7" Rhodes.
20" American Motor Driven.
24" Gould & Eberhardt.

MILLERS
#1 B. & S. Universal.
#1½ B. & S. Universal.
#1B B. & S. Plain.

TURBO COMPRESSOR
250 CFM 16 oz. Spencer.

AIR COMPRESSORS
368 CFM Ingersoll Rand.
249 CFM Bury Class L.
188 CFM Penna. Class 3A.
153 CFM Ingersoll Rand.

WELDERS
750 Amp. Westinghouse, 60 vo. Multiple Arc, Motor Driven.
300 Amp. Lincoln Portable, 50 vo., Motor Driven.
75 Amp. Hobart, 25 vo., Motor Driven.

PLATING GENERATORS
400/200 Amp. 6/12 Vo. Hanson & Van Winkle, Motor Driven.
300 Amp. Mascot 6/7½ vo., Motor Driven.

SAND BLAST OUTFIT
Pangborn Type NH1 #20, All Steel Room, Type CD #2 Dust Arrester, Type AU 341 Tank.

BOILERS, ELECTRIC MOTORS, PUMPS and MACHINE TOOLS.

The above are just a few items from our **stock**

McBRIDE & McCLENNEN—Since 1919
Trading as
DELTA EQUIPMENT CO.
148 N. Third St., Philadelphia, Pa.

GOOD MACHINES—LOW PRICES

LATHES
36"x16' New Haven Q.C. Lathe
20"x10' Rahn-Larmon, Q.C. Taper Attach.
19"x12' Leblond Hvy. Q.C. Lathe
18"x6' Monarch Q.C. Lathe
16"x6' American Q.C. Taper Att.
16"x6' Monarch Geared Hd. M.D.
16"x8' Bradford Q.C. Lathe
16"x8' Sidney, Q.C., Taper Attach.
3½"x60" Lo Swing, 2 Carrgs.

MILLING MACHINES
4—#1 Toledo Hand Mills.

DRILL PRESSES
24" Cin. Drill Presses Tap Att.
36" and 30" Sl. Hd. Drill Presses
#3 Bausch Multiple 32 spl.

PUNCH PRESSES
30 Ton Watson-Stillman Hyd.
#99 Stoll Toggle Press 5" crk.
#1 Toledo OBI

SHAPERS—PLANERS
30"x30"x7' Dietrick & Harvey openside Planer—1 Rail Head & 1 Slide Head
20" V. Ram Shaper
24" Kelly, cone drive Shaper
36x36" Ohio Planer 2 Hds.
24"x24"x6' Grey Planer arr. MD.

GRINDERS
16"x66" Landis Universal #4
14"x50" Norton Plain M.D.
12"x30" B. & S. Plain #14
#3 Van Norman Internal Grinder
#7½ Gardner B.B. Disc Grinder Motor Dr.

MISCELLANEOUS
#65 Heald Grinder
6 Spdl Holmes Nut Tapper
#12-#10 B & O Screw Machines
60 KVA Gibbs Spot Welder Air Op
300 Amp Hobart Ark Welder
10—#2-#2X Garvin Vert. Tappers
#411F Tol. Pr. Sq. Shear 11 Ga.
#12 Barber Colman Hobber
12x12 Gardner Air Compressor
4" Union Cent. Pump M.D.

5 N. St. Clair St. THE TOLEDO MACHINERY EXCHANGE CO. Toledo, Ohio

HIGH GRADE MACHINE TOOLS

LATHES
16"x8' Monarch, 3 S.C.D., D.B.G.
18"x20' Boye & Emmes, 3 S.C.D. D.B.G.
18"x24' Lodge & Shipley, 3 S.C.D. D.B.G.
24"x10' American, 3 S.C.D. D.B.G.
30"x14' American Grd. Hd. M.D.
18"x8' L&S Grd. Hd.
30"x16' H. S. & G., 3 S.C.D., D.B.G.
30"x20' American Grd. Hd. S.P.D.

GRINDERS
12"x36" Landis Self Contained Plain Grinder
#33 Abrasive Surface Grinder
Nos. 55, 60, 65 and 70 Healds

GEAR CUTTERS
3—26", 4—36" B&S 6" Gleason
18H G&E Hobbers #2 Barber Colman
11" Gleason Bevel Gear Cutter
#1 and 4 Adams Farwell Hobbers

BOLT AND PIPE THREADERS
1" Acme Cone Drive 2" Acme class A, belt dr.
2" Landis Pipe Machine, Cone drive
2½" Landis, leadscrew

BORING MILLS
42" Niles Vert. Boring Mill
42"Bullard Rapid Production, Thread Attach.

MILLING MACHINES
#3 Cincinnati H.P. Plain
#4 Cincinnati H.P. Plain
#4 Cincinnati High Power, Universal
#2 Cincinnati Plain
#2 Kempsmith Plain Cone Drive
#2 Cinti Plain

RADIAL AND UPRIGHT DRILLS
2½, 3, 3½, 6' Cinc.-Bick., S.P.D.
3, 3½, 4 and 6' American Triple Purp. Enc. Hd.
4' Mueller, S.P.D. Oil Groove Base.
20" 3 spdle. Barnes camelback

SHAPERS
16", 20", 24" G.&E. mtr. dr. thru g.b.
20"x24" American, S.P.D.
26" Whipp Openside Crank Planer.

MISCELLANEOUS
24x24x10 Ingersoll Millers
10'x3/16" Stoll Shear, Arr. M.D.
20' Covington Power Bending Rolls, 1¼" capt.
Pels Universal Iron Worker.

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CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St. Cincinnati, Ohio

1—No. 8 **Fellows L.S. Gear Lapper.**
1—No. 13 **Fellows L.S. Gear Lapper.**
1—**Tinius Olson Brinnel Machine.**
8—No. 2 **Colburn Manufacturing Drills,** M.D.
2—No. 9 **Minster Drills,** 2 spindle heads adjustable horizontal and vertical positions and to drill up to 45° angle, M.D. with motors.
1—24"x12' **Schumacher Boye Lathe** 3 step cone with countershaft.
1—18"x12' **American** Backed Geared **Engine Lathe,** with countershaft.
2—No. 652 **New Britain Chucking Machines,** A.M.D. less cross slides.
1—1" **National Shear.**
1—13B **Brown & Sharpe Milling Machine,** M.D.
1—No. 17 **Barber Colman Gear Hobber,** M.D.

Your inquiries receive prompt attention

Central Machine Tool Corporation
122-126 Nebraska Ave. Toledo, Ohio
Adams 1914

GEAR MACHINERY

10" GLEASON Universal Spiral Bevel Gear Finishers, M.D.
#16-HS GOULD & EBERHARDT Gear Hobber; M.D. 3-60-220
#16-HS GOULD & EBERHARDT Gear Hobber; S.P.D.
#5-AC LEES-BRADNER Gear Hobber
15" GLEASON Spiral Bevel Generators
4—#5-A LEES-BRADNER Gear Hobbers

Industrial Machinery Co., Inc.
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—to aid in your MODERNIZATION PLANS . . . .

IS BUILT INTO THE TOOLS

EMCO REBUILDS

EMCO can make your modernization dollars do a tremendously big job for you in getting your plant in shape for higher quality, lower-cost production.

EMCO, with a steady stock turn-over, has usually about 1500 late type units on hand to give buyers wide and quick selection.

EMCO mechanics have an average experience in rebuilding machine tools of more than 16 years. This type of mechanic means that the machines you buy are rebuilt to the highest standards.

Some of our machine tools are listed here—our latest stock list shows many more—put it up to Eastern to help you in your modernization—you'll like the results—and we back our work by a guarantee.

MILLING MACHINES
No. 3 Cincinnati Plain, dial type, Timken Bearings, very late type
No. 3 Cincinnati Vertical, dial type, Timken Bearings, very late type
No. 3B Brown & Sharpe Plain, double overarm, m.d. in base, very late
No. 3B Milwaukee Universal, double overarm, m.d.
No. 2A Milwaukee, double overarm, m.d.
No. 3 Cincinnati Universal, cone
No. 2A, 4A Brown & Sharpe Universal, m.d.
No. 2, 2½ Rockford Plain, s.p.d.
No. 1, 2 Cleveland Plain, s.p.d.
No. 2, 3, 4 Cincinnati Plain, cone
No. 2 Van Norman Duplex, cone
No. 4 Kempsmith Plain MaxiMiller, m.d. in base
No. 5B Heavy Brown & Sharpe Plain, m.d.
No. 13B Brown & Sharpe Plain, s.p.d.
No. 2A, 6 Becker Vertical, cone
No. 4 Knight Vert., m.d. in base, jig boring att.
No. 5 Brown & Sharpe Vertical, cone
24″ Cincinnati Automatic Duplex, m.d.
24″ Cin. Auto. Duplex, m.d. widened pattern
48″ Cin. Auto. Duplex, m.d. widened pattern
24″ Cincinnati Plain Automatic, m.d.
48″ Cincinnati Plain Auto., m.d.
24″ Cincinnati Auto. Duplex, belt
48″ Oesterlein Tilted Offset, m.d., National Standard Spindle, Timken Bearings, latest type
No. 21 Brown & Sharpe Auto., s.p.d.
C66A Newton 3 spindle Continuous, m.d.
6x48″, 6x80″ Pratt & Whitney Thread

RADIAL DRILLS
4′, 5′ American Triple Purpose, gear box on base
4′ American Triple Purpose, d.c. drive on base
6′ American Triple Purpose, gear box on arm, a.c. motor, p.r.t.
6′ American Triple Purpose, d.c. drive on arm
5′, 6′ Niles Semi-Universal, d.c. drive on base
5′, 6′ Niles Semi-Universal, gear box on base
7′ Fosdick Plain, cone
5′ Dreses Plain, gear box, 15″ column
5′ Dreses Plain, gear box, 13″ column
4′, 5′, 6′ American Triple Geared, gear box
4′ Morris Plain, gear box
4′ Carlton Plain, gear box on base, inc. head
3′ Fosdick Plain, gear box
3′ Cincinnati Bickford Plain, gear box
3′ American Triple Geared, d.c. drive
3′ American Sensitive, d.c. drive on arm

ENGINE LATHES—GEARED HEAD
12″x6′ Hendey, m.d., taper
14″x6′, 14″x8′ American, m.d.
14″x6′ American, m.d., taper
14″x6′ Hendey, m.d., taper
14″x6′ Lodge & Shipley Selective Head, s.p.d.
14″x6′, 14″x7′, 18″x8′ Prentice
14″x7′ Lodge & Shipley
14″x8′ Hendey, m.d.
16″x8′, 20″x12′ Lodge & Shipley Selec. Hd.
16″x8′, 24″x15′ Reed
18″x8′ Monarch
18″x18′, 20″x8′, 10″x10′, 20″x14′ American
20″x13′ Boye & Emmes Coneless
20″x8′, 20″x10′ Hendey
36″x20′ American

GEAR MACHINERY
15″ Gleason Gear Burnisher, m.d.
6″, 11″ Gleason Straight Bevel Gear Generators
16″ Cincinnati Gear Hobber, m.d.
No. 1 Lees-Bradner Gear Hobber, m.d.
No. 3 Barber-Colman
No. 12 Barber-Colman
No. 12 Barber-Colman, double overarm
No. 3, 3 Heavy, 6—60″, and 6—72″ Brown & Sharpe Gear Cutters
No. 5A Lees-Bradner
36″ Gould & Eberhardt Gear Cutter, s.p.d.
No. 16HS Gould & Eberhardt Type B, s.p.d.
No. 44 Brown & Sharpe, m.d.
No. 61, 62, 612, 615 Fellows
Schuchardt & Schutte Gear Tooth Rounder

BORING MILLS
2—72″ Cincinnati Rapid Production, m.d., 2 heads, heavy pattern, p.r.t.
72″ Colburn, m.d., 2 heads, p.r.t., late type
2—36″ Bullard New Era, m.d., 1 rail head, 1 side head
42″ King, 2 rail heads, 1 side hd, p.r.t., very late
42″ Bullard New Era, m.d., 1 rail hd., 1 side hd.
3—42″ King, 2 rail heads, p.r.t.
42″ Colburn, 2 heads on rail, p.r.t., very late
51″ Bullard, m.d., 2 heads
42″ Niles, m.d., 2 heads
5½″ bar N-B-P Horizontal, m.d., table type

GRINDERS
No. 16-26″ Blanchard, m.d., 25 h.p. mtr. late type
No. 10U Norton Lapper, m.d.
6x10x36″ Norton Type G Surface, m.d.
8″ Arter Rotary Surface, m.d.
14″ Pratt & Whit. Vert. Surface, m.d., ball bear.
15″x15″x72″ Norton Open Side Surface, m.d.
18″x48″ Diamond Face, m.d.
30″x84″ Diamond H. D. Face, m.d.
No. 1 Wilmarth & Morman Universal, belt
No. 2, 3A Cincinnati Universal, belt
No. 2 Brown & Sharpe Universal, belt
No. 2 Landis Universal, belt
18x72″ Cincinnati Automotive Parts, m.d.
No. 11 Giddings & Lewis Teromatic, 3 m.d.
No. 12 Bryant Semi-Automatic Hole, m.d.
No. 15A Bryant Pl. Semi-Auto. 2 spl. Hole&Face
20x144″ Landis Plain Self-Contained Cyl. m.d.
16x72″ Landis, m.d.
16x52″ Landis, m.d.
12x72″ Landis, m.d.
12x48″ Cinn. d.c. m.d. headlock, a.c. main dr., late type
12x18″ Cincinnati Plunge Cut, m.d.
10x18″ Cincinnati Saddle Type, m.d., late
8x36″ Cincinnati Saddle Type, m.d., late
6x32″ Norton, m.d.

TURRET LATHES
No. 3A Warner&Swasey Univ., m.d., 4⅛″ bar cap.
No. 3 Cincinnati Acme Universal, m.d.
No. 1 Foster Turret, m.d. in base, very late
3x36″ Jones&Lamson 2 spdl. Turret, m.d. steel hd.
No. 1B Foster Universal, Timken Bearings, m.d.
No. 1, 2, 4, 6, 8 Warner & Swasey, cone
Gisholt Simplimatic, m.d.
No. 2 Gisholt Turret, m.d. in base
No. 3 Gisholt Turret, geared head
No. 3 Foster, m.d. in base, Timken Bearings
No. 5A, 6A, 6D Potter & Johnston Auto. m.d.
1½x18″, 3x36″ Pratt & Whitney Turret, cone
4-⅞″ Bardons & Oliver Geared Head Turret, m.d.

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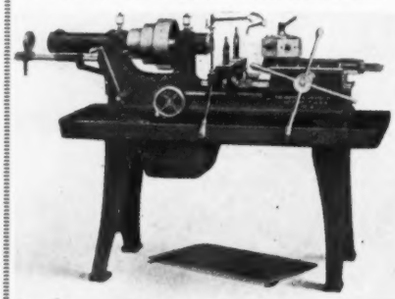
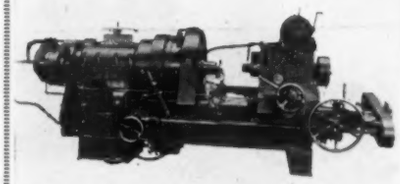
528' 14x12 ER-I INGERSOLL RAND COMPRESSOR
3" LANDIS BOLT CUTTER, geared mtr. dr.
1½" LANDIS BOLT CUTTER with lead screw, belt dr.
90"-12' BETTS VERT. BORING MILL, gear box dr.
24" BULLARD RAPID PROD. VERT. BORING MILL
6" bar SELLERS HORIZ., range 10'x20'
4" bar DETRICK & H. HORIZ., range 52"x52"
3" bar LUCAS TABLE TYPE HORIZ., SPD
15—ton 50' span SHEPARD CRANE, 230 volt DC
15—ton 40' span NILES DET CRANE, 230 volt DC
8' SELLERS RADIAL DRILL, motor drive
6' MUELLER ROUND COL. SEMI-UNIV. RADIAL, gear box
3' AMERICAN RADIAL DRILL, belt drive
No. 2, 10"x36" CIN. UNIV. GRINDER, belt dr.
2—10"x36" LANDIS SELF-CONT. PL. GRINDERS
10"x24" LANDIS SELF-CONT. PL. GRINDER
39"x84" DIAMOND FACE GRINDER, mtr. drive
No. 70 HEALD INTERNAL GRINDER, belt drive
7—⅜"x16" SICHEL HOB GRINDER, mtr. drive
DIAMOND 12x12x36 SURF. GRINDERS
300-ton UNITED ENGR. CO. SING. FRAME STEAM HYD. FORGING PRESS
1400# SELLERS STEAM FORGING HAMMER
600# N.B.P. SINGLE FRAME STEAM FORG. HAMMER
300# SELLERS STEAM FORGING HAMMER
25"x12' CRAWFORD ENGINE LATHE, cone dr.
18"x10' LODGE & SHIPLEY LATHE, QCG, CD
14"x6' BRADFORD LATHE, QCG, taper relieving and draw in attachmen's, CD
24" GISHOLT TURRET LATHE, 6" SPINDLE
No. 6 WARNER & SWASEY TURRET LATHE
2—No. 6 (2") WOOD TILTED TURRET LATHES, CD
No. 6 BROWN & SHARPE TURRET LATHE
No. 4 WARNER & SWASEY UNIV. TURRET LATHE
No. 4 BROWN & SHARPE TURRET LATHE
No. 4 WARNER & SWASEY, grd. friction head



9—No. 2 (1") WARNER & S. PLAIN, power feed to turret, cone drive
14" W. & S. FOX TYPE TURRET LATHES, CD
2—BARDONS & O. AUTO. FACING LATHES
1¼" Four Spindle GRIDLEY Model G
⅝-7/8" CLEVELAND Model A, single cross slide
11"x24' MILLED SCREW & MACH. CO. THD. MILLER, belt drive



No. 27 SMALLEY GENERAL THD. MILLER, 18" pot chuck, 39" deep, 10" hollow spindle

50' SELLERS PLATE PLANER, with 50 air jacks, swiveling hold downs, reversing mtr. dr., complete with mtr. and elec. equip.

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16"x24" 2 HI BLISS DUPLEX MILL, 250 HP motor and gear reduction
16"x24" BLISS REVERSIBLE 2-ROLL HIGH COLD ROLLED STRIP MILL, 350 HP 440 V. AC Mtr.
3—STAND 10"x12" BLISS 2-HI COLD ROLL STRIP MILL, 75 HP Mtrs.

10'x⅛" TEAL PYRAMID ROLL, drop end
No. 504-42" NEWTON COLD SAW, cap. 12½", MD
72" NEWTON VERT. PLANING MACH., mtr. dr.
6,000# AUTO. TRANS. 72" TIER LIFT TRUCK, 6 wheel

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42" Colburn, one swivel and one turret head

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#2 Brown & Sharpe
#2 Landis, arranged M.D.
#3 Landis

SURFACE GRINDERS
#3 Abrasive, M.D.
8" Pratt & Whitney Vertical, M.D.
8" Arter Rotary
#255 Heald Rotary
#16A Blanchard Auto, three m.d.
14" Pratt & Whitney Model B Vert.

LATHES
14"x5' American Geared Head
12"x6' Hendey Yoke Head
14"x6' American Geared Head

LATHES (continued)
16"x6' South Bend
20"x8' Cisco, Taper Attach.
30"x11' American Heavy Duty
20"x12' Lodge & Shipley, taper attach.
24"x12' Cisco, taper attach.
25"x12' LeBlond Heavy Duty
42"x12' Pittsburgh
26"x16' Whitcomb, taper attach.
27"x16' Lodge & Shipley twelve speed geared head, taper attach.
26"-48"x24' McCabe Double Spindle

MILLERS
3" Waltham Thread, M.D.
6"x14" Pratt & Whitney Thread
6"x48" Pratt & Whitney Thread
6"x80" Pratt & Whitney Thread
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New #14 Producto Plain, arr. M.D.
#2 Kempsmith Plain
#4 Brown & Sharpe
#13B Brown & Sharpe Plain
#33 Brown & Sharpe Plain, M.D
#2 Brown & Sharpe Vertical
#6 Becker Vertical
#4 Kempsmith Vertical, rotary table
2—#3 Brown & Sharpe Univ.
24" Garvin Cam

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#5R-16" Standard Straight Side Redraw
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#1½ Bliss D. A. Toggle Drawing
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1"x5" New Britain, M.D.
1⅝"x7" New Britain, M.D.
#5A and #6A Potter & Johnstons

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3"x36" Jones & Lamson Steel Head
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24" Steinle Geared Head
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Automatics, Cleveland Model A & B ⅞ to 4½"
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Grinders, Landis, 10x20" Hydraulic, 30" wheel
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2—20x8 Lodge & Shipley 12 speed geared head spd.
2—24x12 Lodge & Shipley 12 speed geared head tap. att. m. dr.

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1—42" Niles Bement Pond Vertical m. dr.
1—53" Niles Bement Pond Vertical power rapid traverse, m. dr.
1—62" Niles Bement Pond Vertical power rapid traverse, m. dr.

MILLING MACHINES
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2—#2A Brown & Sharpe Universal spd.
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3—#3 Kempsmith Plain, c. dr.
1—#4 Cincinnati Universal c. dr.
2—#4 Cincinnati Plain Hi-Power c. dr.
3—#5 Cincinnati Plain Hi-Power pow. rap. tr. m. dr.

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1—5' American Radial, triple purpose, inclosed head, m. dr.
1—4' Dreses Radial, spd.
1—3½' Cincinnati Bickford Radial, m. dr.
2—3' Cincinnati Bickford Radial, m. dr.
1—3' Fosdick Radial, m. dr.
1—2½' Fosdick Radial, m. dr.

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26"x96" Landis Cylindrical Grinder, self-contained.
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1½" Acme Upsetter, steel frame.
1½" Ajax Upsetter.
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1—#2 Cleveland vertical milling machine
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Shapers **Lathes**
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Sizes:—48″x48″x14′
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44″ Niles-Bement-Pond Heavy Duty. Arranged for motor drive and equipped with power rapid traverse.

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3—46″ x 32′ H.S.G. 15 Speed Geared Head Engine Lathes.
Each Lathe equipped with 2—complete carriages and 2—taper attachments.
36″ x 15′ Punman Geared Head Lathe.
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We specialize in rebuilding metal working machinery and unconditionally guarantee our rebuilt machine tools as to their performance and accuracy.

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8" Bar Beaman & Smith Floor type Horizontal Boring Machine with extra swivel table.

4½" Bar Niles-Bement-Pond Double Spindle Floor Type Horizontal Boring Machine. With table 4½' x 12'.

We carry in stock a large number of rebuilt milling machines, Plain, Universal and Vertical; as well as various size Lathes, Horizontal & Vertical Boring Mills all available for prompt shipment.

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8 speed geared head lathe, motor in leg, taper attachment

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motor drive, round column, gear box, tapping attachment

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back geared crank shaper, single pulley drive, gravity lubrication system

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84" Pond, Vertical Boring & Turning Mill, 2-swivel heads, 72" table, 54" under rail, power elevation to rail, friction feed, cone drive. Good condition.

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72"x54"x24' POND DOUBLE HOUSING PLANER. TWO HEADS ON CROSS RAIL. TWO SIDE HEADS. BELT DRIVE.

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6"x48" PRATT & WHITNEY THREAD MILLERS. BELT DRIVE.

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American 5 ft. Universal Radial Drill.
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42" M.D. Rapid Traverse

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60"—54" Colburn
44" Niles

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Silver 3½'
Dreses—Simplex 3'
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Aveymatic #2
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Barber Colman #12—#3
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Gould & Eberhardt 48"

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32x14 Boye & Emmes; Taper
26x14 Bridgeford; Grd. Hd.; M.D.
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24x12 Greaves-Klusman

10—HENDEY LATHES—12x5; 12x6 — 14x6 — 14x10 — 16x6

American 14x6; 16x8; 20x8
Lodge & Shipley 14x6; 16x8; 18x8; 18x10
Reed-Prentice 20x18; 16x10; 16x6

MILLERS—Plain & Universal
Cincinnati Pl. #4; #3; #1½
Cincinnati Univ. #4; #1½
Kempsmith Pl. #3; #2; #1
Brown & Sharpe #2A; #2 Univ.
Brown & Sharpe #24 M.D.; #1½ Cone
Ohio #2 Univ.
Ohio #3 Plain
Van Norman #2; #0
Rockford #2 Universal
Garvin #2A Universal

#4 WARNER & SWASEY Hand Turret Lathes
Bar Feed; Hexagon Turret; Grd. friction head.

MILLERS—Production
P&W Automatic 8"
P&W #12 Lincoln type
Hendey #5 Lincoln type
B&S #13-B

NIBBLERS
Campbell #1; #1B; 24" thr.

THREADMILLER
Pratt & Whitney 6x20 Geared Head

GRINDERS
Norton 14x50 Plain
Cincinnati 12x36 Plain
Brown & Sharpe #10 M.D.
Bath Univ. #2; #2½
Landis #3; #1 Universal
P&W 12x36 Vert. Surface
Abrasive #3—Surface
W&M #2; #3 Surface
Norton #2 Tool & Cutter
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Bliss 8'x¼"
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Toledo 5'x14 gauge

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#138B Stoll 7" str. 48x42 bed
#79B Stoll 7" str. 48x36 bed
#1 Bliss, Toggle
#23; 21½; 21; 20; 19C; 19; OBI
#600 Toledo Coining 100-tons
Bliss #30 Arch

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Williams & White #42; 2½" str.
10' 6" long; 7" shaft
Motor driven

350-ton WHEEL PRESS
Hydraulic 54" between bars; 18' from ram to resistance

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Toledo #513; 40"x16 gauge

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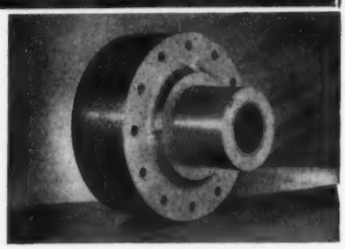

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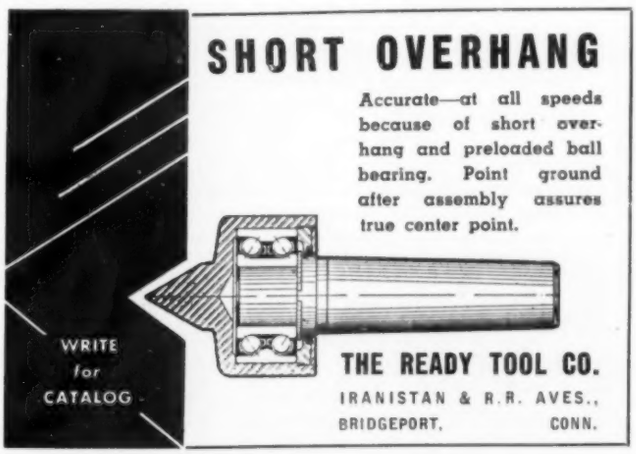
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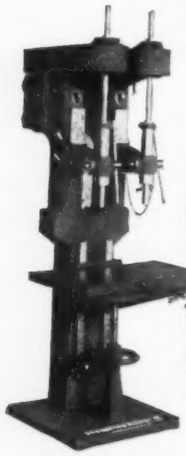

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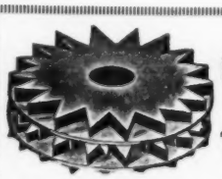

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Canadian Desmond-Stephan Mfg. Co., Ltd. Hamilton, Ontario

No. 0 Desmond Cutters

CUTTERS, Gear
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Michigan Tool Co., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.
Waltham Machine Works (small), Waltham, Mass.

CUTTERS, Keyseater
Davis Keyseater Co., Rochester, N. Y.
National Mach. Tool Co., Cincinnati.

CUTTERS, Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Company, Detroit, Mich.
Excello Corp., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Illinois Tool Works, Chicago, Ill.
Ingersoll Milling Machine Co., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee.
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit, Mich.
Modern Tool Works, Rochester, N. Y.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

CUTTERS, Pipe, Hand
Armstrong Bros. Tool Co., Chicago.

CUTTING, Abrasive
Campbell, Andrew C., Inc., Bridgeport, Conn.

CUTTING, Sheet Metal
Campbell, Andrew C., Inc., Bridgeport, Conn.

CUTTING-OFF MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Etna Machine Co., Toledo, Ohio
Landis Mach. Co., Waynesboro, Pa.
Porter-McLeod Machine Tool Co., Hatfield, Mass.

CUTTING-OFF Machines, Abrasive
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Campbell, Andrew C., Inc., Bridgeport, Conn.
Porter-McLeod Machine Tool Co., Hatfield, Mass.

CUTTING-OFF Machines, Circular Saw
Porter-McLeod Machine Tool Co., Hatfield, Mass.

CUTTING-OFF Machines, Cold Saw
Consolidated Mach. Tool Corp., Rochester, N. Y.

CUTTING-OFF TOOLS
Prosser & Son, Thos., New York.
Williams & Co., J. H., Buffalo, N. Y.

CUTTING TOOLS, Tungsten Carbide
Excello Corp., Detroit, Mich.

DEALERS, Machinery (See Searchlight Section)
Adams, Ogden R., Rochester, N. Y.
Adelphia Equipment Co., Phila., Pa.
Atlantic Machinery Corp., N. Y. C., N. Y.
Bernstein & Co., Geo. M., Chicago, Ill.
Central Machine Tool Corp., Toledo, Ohio
Cincinnati Machy. & Supply Co., Cincinnati, Ohio
Delta Equipment Co., Phila., Pa.
Dony Machry. Co., D. E., Rochester, N. Y.
Eastern Machy. Co., Cincinnati, Ohio
Emerman & Co., Louis E., Chicago.
Falk Machinery Co., Inc., Rochester, N. Y.
General Machinery Corp., Boston, Mass.
Hill-Clarke Mach. Co., Chicago, Ill.
Hyman & Sons, Jos., Phila., Pa.
Indianapolis Mach. & Supply Co., Indianapolis, Ind.
Industrial Machy. Co., Indianapolis, Ind.
Interstate Machinery Co., Inc., Chicago, Ill.
Iroquois Machy. Co., Buffalo, N. Y.
Lafayette Machinery Corp., Detroit, Mich.
Lang Machinery Co., Pittsburgh, Pa.
Lucas & Son Inc., J. L., Bridgeport, Conn.
Lunney, Frank J., Phila., Pa.
Machine Tools Sales Co., Phila., Pa.
Marr-Galbreath Machy. Co., Pittsburgh, Pa.
McCabe & Sheeran Machinery Corp., N. Y. C., N. Y.
McDonald Machy Co., St. Louis, Mo.
Miles Machy Co., Saginaw, W. S., Mich.
Morey & Co., Inc., New York, N. Y.
Moyer, J. N., Phila., Pa.
Nuttall, J., Phila, Pa.
O'Brien Machy. Co., Phila., Pa.
Osborne & Sexton Machy Co., Columbus, O.
Ott Machy. Sales Co., Detroit, Mich.
Riverside Machinery Depot, Detroit, Mich.
Samuel Machinery Co. Inc., Phila, Pa.
Simmons Mach. & Tool Corp., Albany, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, Ohio
Sun Machinery Co., Newark, N. J.
Surplus Material Mchy. Co., Detroit.
Toledo Machry. Exchange Co., Toledo.
Victor Machinery Co., Chicago, Ill.
Victor Machinery Exchange, Inc., New York, N. Y.
West Penn Machy. Co., Pittsburgh, Pa.

DEMAGNETIZERS
Walker Co., O. S., Worcester, Mass.

DIAMONDS, Industrial
Crafts & Co., Inc., Arthur A., Boston,

DIE CASTING MACHINES
Reed-Prentice Corp., Worcester, Mass.

DIE FEEDS
Dickerman Mfg. Co., H. E., Springfield, Mass.

DIE HEADS, Threading
Acme Machinery Co., Cleveland, Ohio

DIEING MACHINES
Henry & Wright Mfg. Co., Hartford, Conn.

DIE-MAKING MACHINES
Gorton Machine Co., Racine, Wis.
Grob Brothers, Grafton, Wis.
Haskins Co., R. G., Chicago, Ill.
Oliver Instrument Co., Adrian, Mich.

DIE MAKER'S BLUE
Dykem Co., St. Louis, Mo.

DIE MAKERS SUPPLIES
Baumbach Mfg. Co., E. A., Chicago.
Danly Mch. Specialties Co., Inc., Chicago, Ill.
U. S. Tool Co., Ampere, N. J.

DIE SETS
Producto Machine Co., Bridgeport, Conn.
U. S. Tool Co., Ampere, N. J.

DIESEL FUEL Injection Pumps
Excello Corp., Detroit, Mich.

DIE SINKING MACHINES
Cincinnati Milling Mach. Co., Cincinnati, Ohio

DIES and TOOLS
Dickerman Mfg. Co., H. E., Springfield, Mass.
Firth-Sterling Steel Co., McKeesport, Pa.
Hamilton Tool Co., Hamilton, Ohio
Taft-Peirce Mfg. Co., Woonsocket, R. I.

DIES, Adjustable and Self Opening
Eastern Mach. Screw Corp., New Haven, Conn.
Errington Mech. Lab., Staten Island, N. Y.
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Murchey Machine & Tool Co., Detroit.

DIES, Round Adjustable
Butterfield Division Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.

DIES, Self Opening
National Acme Co., Cleveland, Ohio

DIES, Steel Marking
Noble & Westbrook Mfg. Co., Hartford, Conn.

DIES, Sub Press
Producto Machine Co., Bridgeport, Conn.

DISCS, Abrasive
Macklin Co., Jackson, Mich.

★ WHERE-TO-BUY DIRECTORY ★

DIVIDERS
Brown & Sharpe Mfg. Co., Providence, R. I.

DIVIDING HEADS
Hart Machine Co., Dorchester, Mass.
Hartford Special Machinery Co., Hartford, Conn.
Scherr Co., Geo., New York, N. Y.

DOGS, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago.
Ready Tool Co., Bridgeport, Conn.
Williams & Co., J. H., Buffalo, N. Y.

DRESSERS, Grinding Wheel
American Swiss File & Tool Co., Elizabeth, N. J.
Carboloy Company, Detroit, Mich.
Crafts & Co., Inc., Arthur A., Boston, Mass.
Desmond-Stephan Mfg. Co., Urbana, Ohio
Norton Co., Worcester, Mass.

DRILL HEADS
U. S. Drill Head Co., Cincinnati.

DRILL SPEEDERS
Graham Mfg. Co., Providence, R. I.

DRILL GRINDING FIXTURES
Industrial Engineering Co. Inc., Minneapolis, Minn.

DRILL UNITS
LeMaire Tool & Mfg. Co., Dearborn, Mich.

DRILLING and Tapping Machines, Multiple
Bullard Company, Bridgeport, Conn.
Errington Mech. Lab., Staten Island, N. Y.
Production Machine Co., Greenfield, Mass.

DRILLING Machines, Automatic and Semi-Automatic
Avey Drilling Machine Co., Cincinnati, Ohio
Barnes Drill Co., Rockford, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Kingsbury Mach. Tool Corp., Keene, N. H.
Sundstrand Machine Tool Co., Rockford, Ill.

DRILLING MACHINES, Bench
Avey Drilling Machine Co., Cincinnati, Ohio
Barnes, W. F. & John Co., Rockford, Ill.

DRILLING MACHINES, Gang
Avey Drilling Machine Co., Cincinnati, Ohio
Barnes, W. F. & John Co., Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Foote-Burt Co., Cleveland, Ohio

DRILLING Machines, Heavy Duty
Barnes Drill Co., Rockford, Ill.
Barnes, W. F. & John Co., Rockford, Ill.
Bryant Machinery & Engineering Co., Chicago, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Cleereman Machine Tool Co., Chicago.
Consolidated Mach. Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland, Ohio

DRILLING MACHINES, Horizontal
Kingsbury Mach. Tool Corp., Keene, N. H.

DRILLING MACHINES, Radial
American Tool Wks. Co., Cincinnati.
Carlton Mach. Tool Co., Cincinnati.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Cincinnati-Gilbert Machine Tool Co., Cincinnati, Ohio
Cleveland Punch & Shear Works, Cleveland, Ohio
Fosdick Machine Tool Co Cincinnati, Ohio

DRILLING MACHINES, Sensitive
Avey Drilling Machine Co., Cincinnati, Ohio
Barnes, W. F. & John Co., Rockford, Ill.
Cleerman Machine Tool Co., Chicago.
Dumore Co., Racine, Wis.
Fosdick Machine Tool Co., Cincinnati, Ohio
Henry & Wright Mfg. Co., Hartford, Conn.
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Machine Co., Greenfield, Mass.
Walker-Turner Co., Inc., Plainfield, N. J.

DRILLING MACHINES, Turret
Kingsbury Mach. Tool Corp., Keene, N. H.

DRILLING Machines, Upright Multiple Spindle
Avey Drilling Machine Co., Cincinnati, Ohio
Barnes, W. F. & John Co., Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Cleerman Machine Tool Co., Chicago.
Consolidated Mach. Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland, Ohio
Fosdick Machine Tool Co., Cincinnati, Ohio
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Kingsbury Mach. Tool Corp., Keene, N. H.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Machine Co., Greenfield, Mass.

DRILLING MACHINES, Vertical
Avey Drilling Machine Co., Cincinnati, Ohio
Barnes, W. F. & John Co., Rockford, Ill.
Bryant Machinery & Engineering Co., Chicago, Ill.
Cleerman Machine Tool Co., Chicago.
Foote-Burt Co., Cleveland, Ohio
Leland-Gifford Co., Worcester, Mass.

DRILLS
Cleveland Twist Drill Co., Cleveland.
Firth-Sterling Steel Co., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.

DRILLS, Bench
Edlund Machine Co., Cortland, N. Y.

DRILLS, Center
Cleveland Twist Drill Co., Cleveland, Ohio
Slocomb Co., J. T., Providence, R. I.
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exch., New York.

DRILLS, Core
Excello Corp., Detroit, Mich.

DRILLS, Flat
Carboloy Company, Detroit, Mich.

DRILLS, Gang
Edlund Machine Co., Cortland, N. Y.

DRILLS, Pneumatic
Dumore Co., Racine, Wis.

DRILLS, Portable Electric
Dumore Co., Racine, Wis.
Standard Electric Tool Co., Cincinnati, Ohio

DRILLS, Radial
Bryant Machinery & Engineering Co., Chicago, Ill.

DRILLS, Ratchet
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Union Twist Drill Co., Athol, Mass.

DRILLS, Single Spindle
Edlund Machine Co., Cortland, N. Y.

DRILLS, Twist and Flat
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, New York, N. Y.

DRIVES, Machine
Western Mfg. Co., Detroit, Mich.

ELECTRIC LIGHT, Universal, Movable, Stay Put
Zagora, J., Machine & Gear Co., Charlotte, N. C.

ELECTRICAL INSTRUMENTS
Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

ELECTRICAL SUPPLIES
Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

ELEVATING TABLES, Portable
Hamilton Tool Co., Hamilton, Ohio

END MILLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

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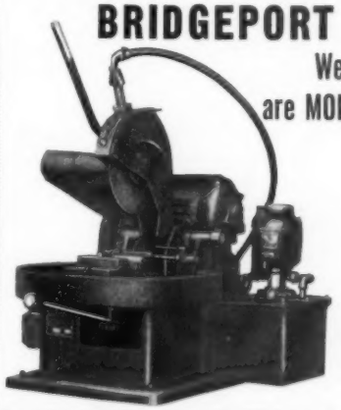

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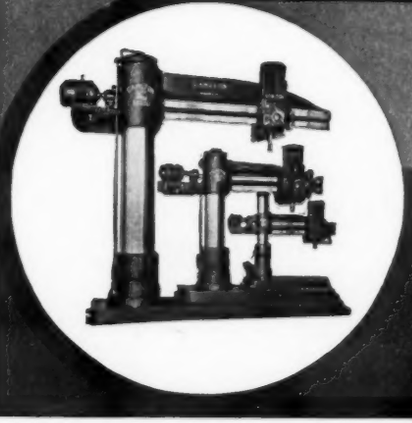

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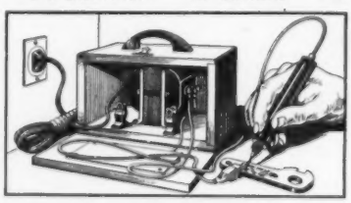

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Excello Corp., Detroit, Mich.

FANS, Electric
Wagner Electric Corp., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FANS, Ventilating
Wagner Electric Corp., St. Louis, Mo.

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Nicholson File Co., Providence, R. I.

FILES, Rotary
American Swiss File & Tool Co., Elizabeth, N. J.

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Haskins Co., R. G., Chicago, Ill.
Illinois Tool Works, Chicago, Ill.
Oliver Instrument Co., Adrian, Mich.

FITTINGS, Hydraulic
U. S. Drill Head Co., Cincinnati, Ohio
Watson-Stillman Co., New York, N. Y.

FIXTURES, Grinding, Special Blade
Industrial Engineering Co. Inc., Minneapolis, Minn.

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Air Reduction Sales Co., New York, N. Y.

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Williams & Co., J. H., Buffalo, N. Y.

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Williams & Co., J. H., Buffalo, N. Y.

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Standard Oil Co. of Indiana, Chicago, Ill.
Texas Company, New York, N. Y.

FURNACES, Brazing
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES, Carburizing
Surface Combustion Corp., Toledo, O.

FURNACES, Direct Heat, Electric
Electric Furnace Co., Salem, Ohio
General Electric Co., Schenectady, N. Y.

FURNACES, Electric
Electric Furnace Co., Salem, Ohio
Johnson Gas Appliance Co., Cedar Rapids, Iowa
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES, Forging
Electric Furnace Co., Salem, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES, Gas
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., Salem, Ohio
Hones, Inc., Chas. A., Baldwin, N. Y.
Johnson Gas Appliance Co., Cedar Rapids, Iowa

FURNACES, Heat-Treating, Tempering and Annealing
Baker & Co., Inc., Newark, N. J.
Electric Furnace Co., Salem, Ohio
Hones, Inc., Chas. A., Baldwin, N. Y.
Hoskins Mfg. Co., Detroit, Mich.
Johnson Gas Appliance Co., Cedar Rapids, Iowa
Stark Tool Co., Waltham, Mass.
Surface Combustion Corp., Toledo, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES, High Speed Muffler
Surface Combustion Corp., Toledo, O.

FURNACES, Melting
Hones, Inc., Chas. A., Baldwin, N. Y.
Johnson Gas Appliance Co., Cedar Rapids, Iowa

FURNACES, Oil Fired
Electric Furnace Co., Salem, Ohio

FURNACES, Soldering
Electric Furnace Co., Salem, Ohio
Hones, Inc., Chas. A., Baldwin, N. Y.
Johnson Gas Appliance Co., Cedar Rapids, Iowa

FURNITURE, Machine Shop
Midwest Tool & Engrg. Co., Dayton, Ohio.
New Britain-Gridley Machine Co., New Britain, Conn.
Remington Rand, Inc., Buffalo, N. Y.

GAGE BLOCKS
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GAGES
Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Comparator
Federal Products Corp., Providence, R. I.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., New York, N. Y.

GAGES, Depth
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

GAGES, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Starrett Co., L. S., Athol, Mass.

GAGES, Gear
Federal Products Corp., Providence, R. I.
LeMaire Tool & Mfg. Co., Dearborn, Mich.

GAGES, Hard Carbide Tipped
McKenna Metals Co., Latrobe, Pa.

GAGES, Plug and Ring
Brown & Sharpe Mfg. Co., Providence, R. I.
Crafts & Co., Inc., Arthur A., Boston, Mass.
Dickerman Mfg. Co., H. E., Springfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Pressure
Brown Instrument Co., Philadelphia, Pa.

GAGES, Snap and Cylindrical
Brown & Sharpe Mfg. Co., Providence, R. I.
Dickerman Mfg. Co., H. E., Springfield, Mass.
Federal Products Corp., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Williams & Co., J. H., Buffalo, N. Y.

GAGES, Standard
Hanson-Whitney Machine Co., Hartford, Conn.

GAGES, Surface
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

GAGES, Taper
Brown & Sharpe Mfg. Co., Providence, R. I.

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Brown Instrument Co., Philadelphia, Pa.

GAGES, Thickness
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

GAGES, Thread
Brown & Sharpe Mfg. Co., Providence, R. I.
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Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

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American Machine & Metals, Inc., Tolhurst Centrifugal Div., E. Moline, Ill.

GAS BURNERS
Johnson Gas Appliance Co., Cedar Rapids, Iowa

GASES, Compressed
Air Reduction Sales Co., New York, N. Y.

GASOLINE
Standard Oil Co. of Indiana, Chicago, Ill.

GEAR BLANKS, Composition
Bakelite Corp., New York, N. Y.

GEAR BURNISHING MACHINES
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
phia, Pa.

GEAR CHECKING MACHINES
Michigan Tool Co., Detroit, Mich.

GEAR CHUCKS
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Adams Co., Dubuque, Ia.
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Bilgram Gear & Machine Works, Philadelphia, Pa.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
National Broach & Machine Co., Detroit, Mich.
Producto Machine Co., Bridgeport, Conn.
Scherr Co., Geo., New York, N. Y.

GEAR LAPPING MACHINES
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
National Broach & Machine Co., Detroit, Mich.

GEAR MEASURING MACHINES
Fellows Gear Shaper Co., Springfield, Vt.
National Broach & Machine Co., Detroit, Mich.

GEAR SHAVING MACHINES
National Broach & Machine Co., Detroit, Mich.

GEAR TEMPERING MACHINES
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Gleason Works, Rochester, N. Y.

GEAR TESTING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
National Broach & Machine Co., Detroit, Mich.

GEARS, Cast
Bilgram Gear & Machine Works, Philadelphia, Pa.
Braun Gear Corp., Brooklyn, N. Y.
Ganschow Gear Co., Chicago, Ill.
Grant Gear Works, Boston, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.

GEARS, Cut
Adams Co., Dubuque, Ia.
Braun Gear Corp., Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Earle Gear & Machine Co., Philadelphia, Pa.
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Ganschow Gear Co., Chicago, Ill.
Gear Specialties, Inc., Chicago, Ill.
Gleason Works, Rochester, N. Y.
Grant Gear Works, Boston, Mass.
Hartford Special Machy. Co., Hartford, Conn.
James Co., D. O., Chicago, Ill.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Massachusetts Gear & Tool Co., Woburn, Mass.
Meisel Press Mfg. Co., Boston, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Pittsburgh Gear & Machine Co., Pittsburgh, Pa.

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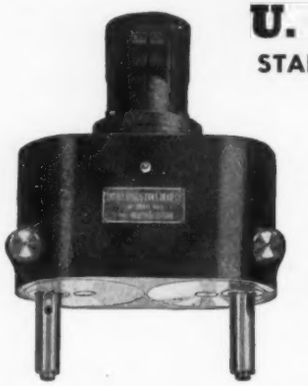

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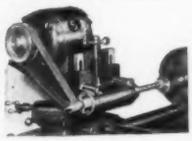

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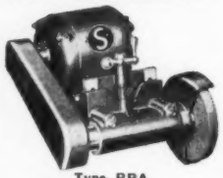

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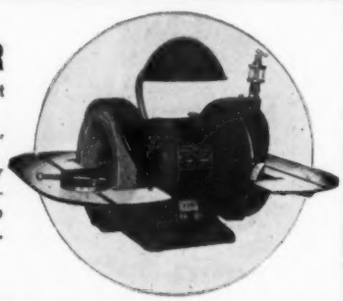

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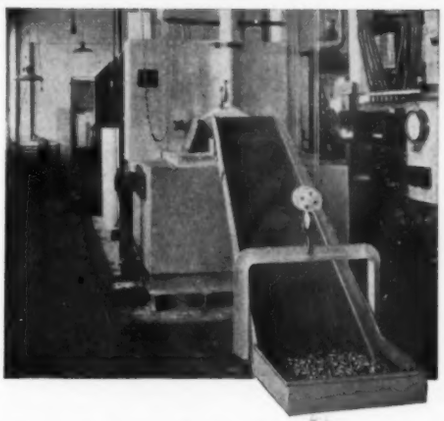

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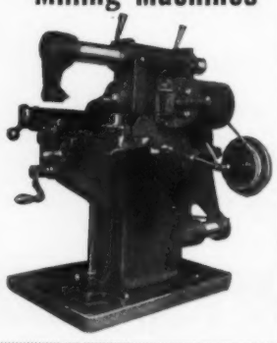

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Lodge & Shipley Mach. Tool Co., Cincinnati, Ohio
Monarch Machine Tool Co., Sidney, Ohio
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
Sheldon Machine Co., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio
South Bend Lathe Works, South Bend, Ind.
Springfield Mach. Tool Co., Springfield, Ohio
Sundstrand Machine Tool Co., Rockford, Ill.

LATHES, Wheel, RR
Sellers & Co., Inc., Wm., Philadelphia, Pa.

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Dykem Co., St. Louis, Mo.

LIGHT Bulbs
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

LIGHT, Universal Movable Stay Put
Zagora, J., Machine & Gear Co., Charlotte, N. C.

LOCK Washers
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Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, O.
Eaton Mfg. Co., Massillon, O.
National Lock Washer Co., Newark, N. J.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia
Positive Lock Washer Co., Newark, N. J.
Spring Washer Institute, Chicago
Washburn Co., Worcester, Mass.

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Shell Oil Co. Inc., New York, N. Y.
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Standard Oil Co. of Indiana, Chicago, Ill.
Sun Oil Co., Philadelphia, Pa.
Texas Company, New York, N. Y.
Tide Water Oil Sales Corp., New York, N. Y.

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Rivett Lathe & Grinder, Inc., Boston, Mass.

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MACHINE Tool Drives, Electric
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Starrett Co., L. S., Athol, Mass.

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Cleveland Twist Drill Co., Cleveland, Ohio
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

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Brewster & Co., Wm., New York, N. Y.

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Scherr Co., Geo., New York, N. Y.

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Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

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Kearney & Trecker Corp., Milwaukee, Wis.
Porter-Cable Machine Co., Syracuse, N. Y.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Machine Tool Co., Rockford, Ill.

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McKenna Metals Co., Latrobe, Pa.

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Hart Machine Co., Dorchester, Mass.

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Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Stark Tool Co., Waltham, Mass.
Sundstrand Machine Tool Co., Rockford, Ill.

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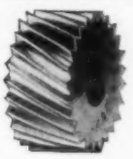
Ingersoll Milling Machine Co., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Machine Tool Co., Rockford, Ill.

MILLING Machines, Drum Type
Consolidated Mach. Tool Corp., Rochester, N. Y.



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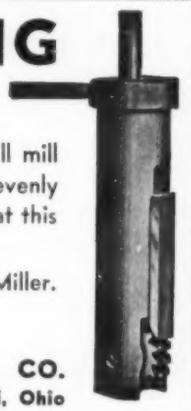

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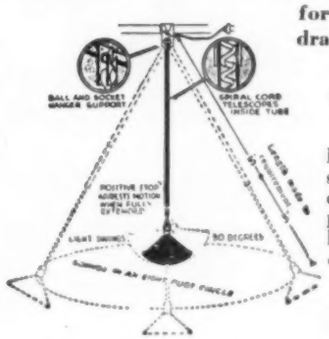

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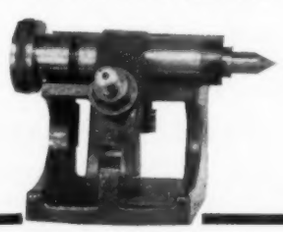

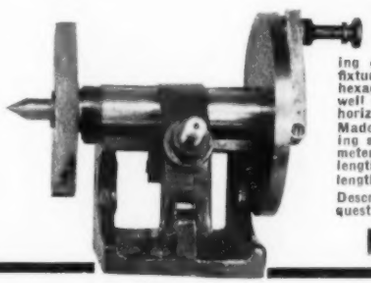

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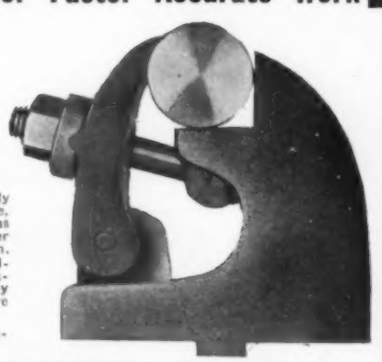

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Knight Machinery Co., W. B., St. Louis, Mo.
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Ingersoll Milling Machine Co., Rockford, Ill.
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Linley Brothers Co., Bridgeport, Conn.
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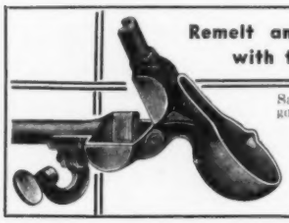

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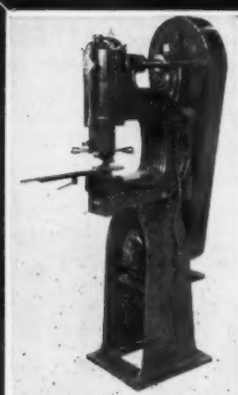

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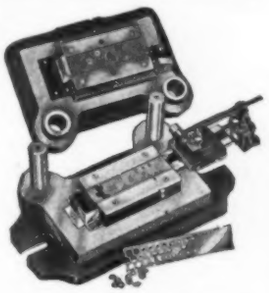

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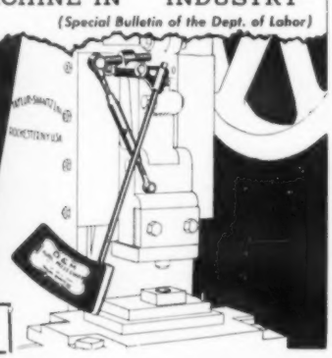

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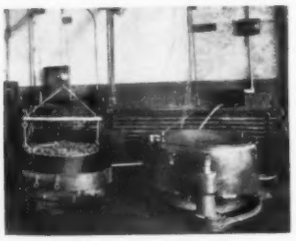

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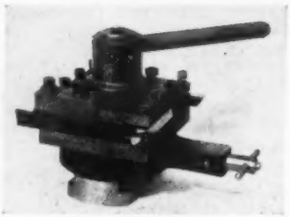

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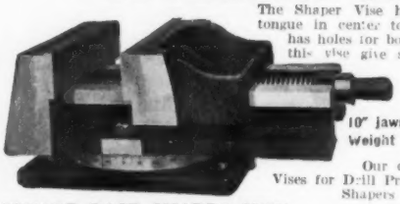

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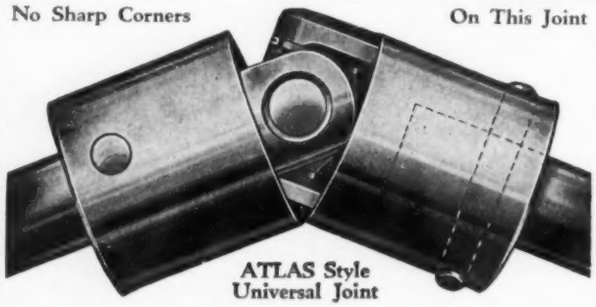

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TUNGSTEN, Carbide Tool
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Nuttall, J., Phila., Pa.
O'Brien Machinery Co., Phila., Pa.
Osborne & Sexton Machy. Co., Columbus, Ohio
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Riverside Machinery Depot, Detroit, Mich.
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VISES, Drilling Machine
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Graham Mfg. Co., Providence, R. I.
Hartford Special Machy. Co., Hartford, Conn.
Johnson Tool Co., East Providence, R. I.
Sheldon Machine Co., Chicago, Ill.

VISES, Machine
Plunket Machine Co., J. E., Chicago, Ill.

VISES, Machinist
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Wiedemann Machine Co., Phila., Pa.

VISES, Milling Machines
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Hartford Special Machy. Co., Hartford, Conn.
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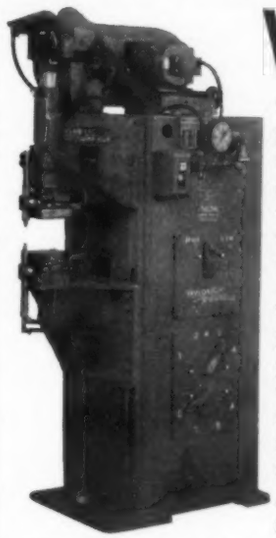

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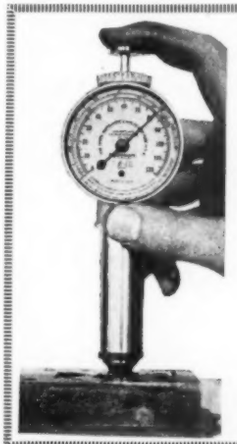

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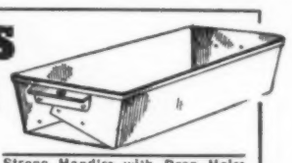

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